COUNTY of VENTURA
Department of Airports

2889 West Fifth Street
Oxnard, CA 93030
Phone: (805) 382-3022
Fax: (805) 382-9845
www.ventura.org/airports
www.iflyoxnard.com

Plans and Specifications
for
Oxnard Airport

RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT RECONSTRUCTION

2889 West 5th Street
Oxnard, California 93030

Specification Number: **DOA 20-02**

Project Number: **OXR-146**

FAA Design AIP Number: **03-06-0179-37-2020**
FAA Const. AIP Number: **03-06-0179-38-2021**

March 30, 2021

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OXNARD AIRPORT

RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT RECONSTRUCTION

Approved by Engineer of Record:

Jannet Loera Gutierrez, PE

Christopher Michael Hunter, PE
(Part 13 – Lighting Installation)

3-30-21

3-30-21

SPECIFICATION ITEMS COVERED BY THESE SEALS:

Project Specific Requirements for Airport Construction

Part 1 – Technical Specifications
Item SP-100 General Requirements for Airport Construction
Item SP-102A Water Pollution Control, Erosion Control, and SWPPP
Item SP-106 Project Requirements – Key Personnel
Item SP-107 Project Requirements – Scheduling of Work
Item SP-108 Project Requirements – Partnering
Item SP-126 Removing Miscellaneous Structures

Part 2 – Construction Safety and Phasing Plan (CSPP)

FAA Standard Specifications for Construction of Airports (Advisory Circular 150-5370-10H)

FAA Technical Specifications – Parts 1-2

Part 1 – General Contract Provisions

Part 2 – FAA General Construction Items
Item C-100 Contractor Quality Control Program
Item C-102 Temporary Air and Water Pollution, Soil Erosion, and Siltation Control
Item C-105 Mobilization
Item C-110 Method of Estimating Percentage of Material Within Spec Limits (PWL)

Part 3 – Sitework
Item P-101 Preparation/Removal of Existing Pavements
Item P-151 Clearing and Grubbing
Item P-152 Excavation, Subgrade, and Embankment
Item P-153 Controlled Low-Strength Material (CLSM)
Item P-155 Lime-Treated Subgrade

Part 4 – Base Courses
Item P-209 Crushed Aggregate Base Course

Part 6 – Flexible Pavements
Item P-401 Asphalt Mix Pavement

Part 8 – Surface Treatments
Item P-608 Emulsified Asphalt Seal Coat

Part 9 – Miscellaneous
Item P-603 Emulsified Asphalt Tack Coat

Part 9 – Miscellaneous cont'd
Item P-605 Joint Sealants for Pavements
Item P-606 Adhesive Compounds, Two-Component for Sealing Wire & Lights in Pavement
Item P-610 Concrete for Miscellaneous Structures
Item P-620 Runway and Taxiway Marking
Item P-621 Saw-Cut Grooves

Part 11 - Drainage
Item D-701 Pipe for Storm Drains and Culverts
Item D-705 Pipe Underdrains for Airports
Item D-751 Manholes, Catch Basins, Inlets and Inspection Holes
Item D-754 Concrete Gutters, Ditches and Flumes

Part 12 – Turfing
Item T-901 Seeding
Item T-905 Topsoil

Part 13 – Lighting Installation
Item L-108 Unground Power Cable for Airports
Item L-110 Airport Underground Electrical Duct Banks and Conduits
Item L-115 Electrical Manholes and Junction Structures
Item L-125 Installation of Airport Lighting Systems

These specifications, including the designs incorporated herein, are an instrument of professional service prepared for use in connection with the project identified hereon under the conditions existing on 10/22/2020. Any use, in whole or in part, for any other project without written authorization of MEAD AND HUNT, INC., shall be at user's sole risk.

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Oxnard Airport

RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT RECONSTRUCTION

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FAA TECHNICAL SPECIFICATIONS – PARTS 1-2

Part 1 – FAA General Contract Provisions

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FAA TECHNICAL SPECIFICATIONS – PARTS 3-13

Part 3 – Sitework

Part 4 – Base Courses

Part 5 – Stabilized Base Courses – Not Used

Part 6 – Flexible Pavements

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COUNTY OF VENTURA

NOTICE INVITING BIDS
PROPOSAL FORM - SPECIFICATIONS

FOR

NAME: **OXNARD AIRPORT**
RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT RECONSTRUCTION

PROJECT LOCATION:	**2889 West Fifth Street, Oxnard, California 93030**
SPECIFICATION NO.:	**DOA 20-02**
PROJECT NO.:	**OXR-146**
FAA DESIGN AIP NO.:	**03-06-0179-37-2020**
FAA CONSTRUCTION AIP NO.:	**03-06-0179-38-2021**
DESIGNED BY :	**Mead & Hunt, Inc.**
REVIEWED BY :	**Department of Airports**
PROJECT COORDINATOR:	**Erin Powers**

DATE: MARCH 30, 2021

RECOMMENDED BY:

Erin Powers

Project Coordinator

APPROVED BY:

Kip Turner

Director of Airports

BIDS WILL BE RECEIVED UNTIL:
3:00 P.M. (PST) THURSDAY,
APRIL 29, 2021

AT:
DEPARTMENT of AIRPORTS
ADMINISTRATION OFFICE
PUBLIC COUNTER: 2ND FLOOR LOBBY
555 AIRPORT WAY, SUITE B
CAMARILLO, CA 93010

PLANS & SPECIFICATIONS available online only @
www.QuestCDN.com

Login to Quest or subscribe (no fee to become a member)

Quest Project Number is: 7693593

Download Plans & Specifications (includes all bid documents needed) Fee is $6.00

COUNTY of VENTURA

NOTICE INVITING BIDS

(ADVERTISEMENT for BIDS)

Sealed Proposals (Bids) will be received by the undersigned in the Bid Box at the Department of Airports, Administration Office – Public Counter, 2nd floor lobby; 555 Airport Way, Suite B, Camarillo, CA 93010; until **3:00 P.M. APRIL 29, 2021** for the **OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT RECONSTRUCTION** project, County Specification No. **DOA 20-02**, which consists of the following major work items:

BASE BID:
Runway Improvements: paving, lighting, MALSF upgrades, signage, grading, storm-drainage, and marking

BID ALTERNATE 1:
Taxiway Improvements: paving, lighting, signage, grading, storm-drainage, and marking

BID ALTERNATE 2:
Taxiway Improvements: paving, lighting, signage, grading, storm-drainage, and marking

The estimated total Project cost of construction is: $26.5 million

Proposals (Bids) will be publicly opened after said time. The Plans, Specifications and Proposal forms for this project are filed in the office of the undersigned and are by reference made a part of this Notice.

There will be a **NON-MANDATORY ONLINE/TELEPHONE** pre-bid conference scheduled for April 6, 2021 at 10:00 a.m. PST**.** Bidders may join through the following link.
https://teams.microsoft.com/l/meetup-join/19%3ameeting_YWZiZDZiYzAtMmU1Zi00YzAyLWEwNjctOTVmM2FmYTViOWQ5%40thread.v2/0?context=%7b%22Tid%22%3a%22b467145b-e9b5-4d22-a13d-8331f319ce09%22%2c%22Oid%22%3a%22ea867038-9ac8-4e16-90d9-cd540d59dfb6%22%7d

Bidders may join by dialing 1-213-282-4570. The PIN to access the meeting is 764632121#.

For participants attending the pre-bid conference, send attendee's name, company name, telephone number, and email address to Jannet Loera at jannet.loera@meadhunt.com by 5:00 p.m. PST on April 6, 2021 to be included in the meeting attendance list.

JOB WALK AND SITE VISIT. An escorted, vehicular site visit will be provided by appointment only. Appointments will be available from April 7, 2021 to April 8, 2021 between 9:00 a.m. and 3:00 p.m. PST at the Airport. Appointments can be made by emailing Erin Powers at erin.powers@ventura.org. Each "Prime Bidder" will be allowed 1 vehicle with up to 2 occupants on-site during this time period. A "Prime Bidder" shall be a bidder who has downloaded the bid documents from Quest and is listed as a "Prime Bidder" as of 3:00 p.m. on April 6, 2021. Prime bidders wishing to attend shall meet at 2889 W 5th St, Oxnard, CA 93030. Vehicles will be under continuous escort, and no questions will be answered during the escort. For technical question submission see below. The deadline to request a job walk/site visit is April 6, 2021 at 5:00 p.m. PST.

Said documents may be obtained online from ***Quest Construction Data Network (Quest CDN)*** at www.questcdn.com. Interested parties may download the digital documents for six dollars ($6.00), by

inputting **Quest Project #7693593** on the Project Search page. Those downloading the bidding documents electronically do so at their own risk for completeness of documents. Please contact Quest CDN at (952)233-1632 or info@questcdn.com for assistance in free membership registration, downloading, and working with this digital project information.

Note: Make sure to provide your correct email address when setting up account with Quest; all information (i.e. addenda, correspondence, etc.) will be issued via Quest to email address provided. Also make sure QuestCDN.com is not blocked in your system; important information may end up in "junk" folder.

The Documents may also be previewed online prior to ordering at no charge via Quest CDN as specified above.

For technical questions concerning the bidding documents email: Jannet Loera at Jannet.Loera@meadhunt.com. The email subject line shall include airport and project name. **No questions will be answered after the RFI deadline of 5:00 pm on April 16, 2021**. (See Proposal (Bid), Instructions to Bidders, Item 4 for further information.) **PLEASE DO NOT CALL THE UNDERSIGNED.**

APWA-AGC Standard Specifications for Public Works Construction referred to by the Specifications, are available from BNI Publications Inc., Vista, CA @ www.BNIBooks/BNIPublications .

Federal Requirements

This project is funded under the Federal Aviation Administration (FAA) Airport Improvement Program (AIP). Contractor(s) will be required to comply with specific federal contract provisions as listed herein and contained in the Bid Documents.

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Timetables

Goals for minority participation for each trade:	21.5%
Goals for female participation in each trade:	6.9%

These goals are applicable to all of the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and non-federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a) and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith

effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the *goals* will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs (OFCCP) within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this notice and in the contract resulting from this solicitation, the "covered area" is California, Ventura County, and Oxnard.

CIVIL RIGHTS TITLE VI ASSURANCES

Ventura County, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 USC §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders or offerors that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

FEDERAL PROVISIONS

The following provisions are incorporated herein by reference with the same force and effect as if given in full text:

(a) Buy American Preference (Reference: 49 USC § 50101)
(b) Civil Rights – Title VI Assurance (Reference: (49 USC § 47123, FAA Order 1400.11)
(c) Davis Bacon Act (Reference: 2 CFR § 200, Appendix II(D); 29 CFR Part 5)
(d) Debarment and Suspension (Reference: 2 CFR part 180 (Subpart C); 2 CFR part 1200; and DOT Order 4200.5)
(e) Disadvantaged Business Enterprise (49 CFR part 26)
(f) Foreign Trade Restriction Certification (Reference: 49 USC § 50104; 49 CFR part 30)
(g) Lobbying and Influencing Federal Employees (Reference: 31 USC § 1352 – Byrd Anti-Lobbying Amendment; 2 CFR part 200, Appendix II(J); and 49 CFR part 20, Appendix A)
(h) Procurement of Recovered Materials (Reference: 2 CFR § 200.322; 40 CFR part 247; and Solid Waste Disposal Act)

(See Federal Provisions of the Contract Bid Documents for further details.)

Successful Bidder/Contractor will be required to insert applicable federal contract provisions in all subcontracts and shall be responsible for compliance by subcontractor(s).

Disadvantaged Enterprise Goal

A DBE Goal of **5.00%** has been established for this contract.

Information submitted as a matter of bidder responsibility:

The Owner's award of this contract is conditioned upon Bidder or Offeror satisfying the good faith effort requirements of 49 CFR §26.53.

The successful Bidder or Offeror must provide written confirmation of participation from each of the DBE firms the Bidder or Offeror lists in its commitment within five days of Notice of Apparent Low Bid.

1. The names and addresses of Disadvantaged Business Enterprise (DBE) firms that will participate in the contract;

2. A description of the work that each DBE firm will perform;

3. The dollar amount of the participation of each DBE firm listed under Item 1;

4. Written statement from Bidder or Offeror that attests their commitment to use the DBE firm(s) listed under Item 1. to meet the Owner's project goal; and

5. If Bidder or Offeror cannot meet the advertised project DBE goal, evidence of good faith efforts undertaken by the Bidder or Offeror as described in appendix A to 49 CFR part 26.

The requirements of 49 CFR part 26 apply to this contract. It is the policy of Ventura County to practice nondiscrimination based on race, color, sex, or national origin in the award or performance of this contract. The Owner encourages participation by all firms qualifying under this solicitation regardless of business size or ownership.

Public Works Contractor Registration Law (SB 854)

Per Public Works Contractor Registration Law (SB 854), Contractors and Subcontractors who intend to Propose (Bid) or perform work on this Project must be registered with the Department of Industrial Relations at the time of Contract award. Information is available at https://www.dir.ca.gov/faqslist.html.

- No contractor or subcontractor may be listed on a bid proposal for a public works project (submitted on or after March 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)].
- No contractor or subcontractor may be awarded a contract for public work on a public works project (awarded on or after April 1, 2015) unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.
- This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

Required Contractor's License(s)

Proposers or Bidders shall have a **Class A** California Contractors license, at the time of award.

Bids

Proposals (Bids) must be submitted utilizing the complete original Proposal furnished with said documents. Each bid shall be in accordance with the Plans and Specifications and other Contract Documents now on file with **COUNTY OF VENTURA** at the address below, for review only.

Each Proposer or Bidder must complete, sign, and furnish with his bid all forms and certifications contained in the Proposal Forms section of the Bid Documents. All proposals sent by mail must be posted so as to be in the hands of the Department of Airports by the hour and date set forth above for the bid opening. All proposals shall be addressed to:

County of Ventura: Department of Airports, Administration Office Public Counter, 2nd Floor Lobby
555 Airport Way, Suite B; Camarillo, CA 93010

and marked**:** **Oxnard Airport Runway 7-25, Taxiway Connectors, and Parallel Taxiway Pavement Reconstruction**
DOA 20-02

Each Proposal (Bid) must be accompanied by a **Bid Guarantee (Bid Bond)** in the amount of not less than **5%** of the amount Proposed (Bid), **PAYABLE to the COUNTY of VENTURA** and guaranteeing that the Proposer (Bidder) will enter into a Contract in accordance with the terms of the Proposal documents (Bid Form) if award is made to them. The Bid Guarantee shall be in one of the following forms: 1) a Bid Bond written by an admitted surety insurer on the form included with the Proposal, 2) a cashier's check drawn by a National bank, a check certified by a National bank or 3) cash. An electronically transmitted copy (FAX) of the Bid Bond form included in the Proposal form may be used, but the form must have the original signatures of the Principal and Surety. A Faxed copy of the completed bond will not be accepted.

The County of Ventura shall have the right to reject any Proposals (Bids) presented in accordance with Section 20150.9 of the California Public Contracts Code.

The Proposer or Bidder to whom award is made will be required to furnish a Performance Bond and a Payment Bond, each in the amount of 100% of the Contract Price.

In accordance with Section 22300 of the Public Contract Code, securities may be substituted for funds withheld.

Prevailing wage rates

Contractor will be required to pay employees and keep records in accordance with the Davis Bacon Act (29 CFR Part 5) and/or the Federal Fair Labor Standards Act (29 CFR part 201). The higher of either the State or Federal wages must be paid to employees.

The CA Prevailing Wage Rates determined by the State for Ventura County can be found here: https://www.dir.ca.gov/OPRL/DPreWageDetermination.htm

Federal Prevailing Wage rates can be found here: https://beta.sam.gov/

Both determinations must be complied with. The Contractor must post copies of the prevailing wage schedule at each job site.

Basis of Award

County reserves the right to reject any and all bids. The contract will be awarded, after a complete contract is prepared, to the lowest responsible bidder, whose proposal complies with all of the requirements prescribed. The lowest bid will be determined by the total aggregate sum of Schedule A: Base Bid and Schedule B: Base Bid Transition. In accordance with CPCC 20103.8(b), "the lowest bid shall be the lowest total of the bid prices on the base contract and those additive or deductive items that were specifically identified in the bid solicitation as being used for the purpose of determining the lowest bid price." County has at their discretion, the right to award a contract for Schedule A and any number of additional schedules or combination of additional schedules that fit within the funds available for the project. County has option to not award a contract for the project without reason.

Dated this 30th Day of March 2021

Kip Turner
Director of Airports
Department of Airports
555 Airport Way, Suite B, Camarillo, CA 93001

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NOTICE TO BIDDERS, SUBCONTRACTORS, AND SUPPLIERS

Plans & Specifications may be obtained @ *www.QuestCDN.com*
*Search Project Number**:*** ***7693593***

The following should be used to obtain information concerning this project:

Type of Information Desired	Contact
List of Plan Holders	*www.QuestCDN.com*
Addenda issued	*www.QuestCDN.com*

Technical questions regarding the Plans or Specifications contact:

Mead & Hunt, Inc
Contact: Jannet Loera
Jannet.Loera@meadhunt.com

Bid Documents may be viewed at the www.QuestCDN.com

BID RESULTS

Within 48 hours	call	(805) 388-4205
Day of Bid Opening:	or Email	erin.powers@ventura.org

NOTE: A Bid Summary will be posted on *QuestCDN.com* after bid opening.

Please do not call other staff members or consultants.

The bid opening will not be postponed, so please contact us as early as possible in the bidding process to discuss problems with the documents which may require addenda to be issued.

COUNTY of VENTURA
Department of Airports

OXNARD AIRPORT
COUNTY OF VENTURA, DEPT. OF AIRPORTS
RUNWAY 7-25, TAXIWAY CONNECTORS,
AND TAXIWAY F RECONSTRUCTION

3138400-181115.02
9/23/2020

DEPARTMENT OF AIRPORTS
LOCATION MAP

NOT TO SCALE

Mead & Hunt

9/23/2020 3:28:54 PM
X:\3138400\181115.02\TECH\DESIGNSPECS\02A. NOTICE INVITING BIDS\4 - MAP TO DELIVER TO\BACKUP\BIDDERS DELIVER LOCATION MAP.DWG

INSTRUCTIONS TO BIDDERS
AND
PROPOSAL (BID) DOCUMENTS

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INSTRUCTIONS TO BIDDERS

1. LICENSING of BIDDER. Before submitting a Proposal (Bids), Proposers or Bidders shall be licensed in accordance with the provisions of Sections 7000 through 7145 of the Business and Professions Code of the State of California in the classification required for the work bid on. The Bidder's license number, classification, and expiration date shall be inserted on the last page of the Proposal document (Bid Form). The Bidder's name shall correspond in all respects with the name shown on the license. License numbers and names are checked with the State.

2. CALIFORNIA REGISTRATION REQUIREMENT.

- No Contractor or Subcontractor may be listed on a Proposal (Bid) document for a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code, Section 1725.5 [i.e. with limited exceptions from this requirement for Proposal (Bid) purposes only under Labor Code, Section 1771.1(a)].
- No Contractor or Subcontractor may be awarded a Contract for public work on a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code, Section 1725.5.
- The project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

3. SITE INSPECTION. Personally visit the worksite before submitting your Proposal (Bid) to ascertain the existence of any surface or subsurface conditions affecting the cost of the work.

4. MODIFICATION, INTERPRETATION, and ADDENDA. Carefully review the Plans, Specifications, and other Contract Documents for any errors, omissions, or ambiguities. If you discover any, submit your questions or request for information / clarification by email as indicated in the *Notice Inviting Bids*. The email subject line shall include airport and project name. **No questions will be answered after the RFI Deadline**. The person submitting the request will be responsible for its prompt delivery. Written Addenda shall be the sole means for modifying the Plans and/or Specifications prior to the Bid Opening. The Agency shall not be bound by oral communications purportedly modifying or interpreting the Plans and/or Specifications regardless of when or by whom such oral communications are made, and Proposers or Bidders should not rely upon such oral communications in preparing the Proposal (Bid).

Addenda will be uploaded to QuestCDN.com. A notice will be generated to all plan holders who have purchased bid documents. It is the bidder's responsibility to download the Addenda from QuestCDN.com. Unless so noted, subject matters shall be interpreted to favor the Agency. All addenda must be acknowledged by signature where provided on the Proposal forms and submitted with bid. Verbal interpretations are not to be relied upon. Failure of the bidder to call attention to irregularities or lack of clarity will not relieve the bidder of performance under the contract.

5. PROPOSAL (BID) ITEMS. State both IN WRITING and IN FIGURES the Unit Prices, Lump Sum amounts and extensions as indicated on the Proposal document (Bid Form) which shall be the prices for which you propose to supply all materials and services and perform all work required by the Plans and Specifications. All Items described are to be construed as complete and in place. Include in the Bid Amount for Items listed on the Proposal document (Bid Form) the cost of performing all work shown on the Plans or required by the Specifications for which a specific Bid Item is not provided. Bid on all Items listed under Bid Schedule (Schedule of Work and Prices) unless otherwise indicated in the Proposal (Bid Form).

6. SIGNING of PROPOSAL (BID) DOCUMENTS. Fill in all indicated blanks in this Proposal document (Bid Form) using typewriter or ink and sign with ink. All the proposal (bid) forms as designated on the Bidder's Checklist must be signed and submitted with proposal. Proposals (Bids) signed by an agent other than an Owner, Partner or Corporate Officer shall be accompanied by a Power-of-Attorney. Proposal document (Bid Form) must be dated.

See FAA GENERAL CONTRACT PROVISIONS Section 20, "Proposal Requirements and Conditions," for general details on the preparation of proposals for this Project.

Note: Each bidder shall submit "evidence of competency" and "evidence of financial responsibility" to the Owner at the time of bid opening.

7. PROPOSAL (BID) FORM NOT to be ALTERED. Do not change the wording of this Proposal document (Bid Form). Any additions, deletions, conditions, limitations or provisions by the Bidder will render the Proposal (Bid) irregular and may cause its rejection.

8. CORRECTING PROPOSAL (BID). Explain on the Proposal form above your signature any erasures or deletions of information entered by the Proposer or Bidder in this Proposal document (Bid Form). Modifications submitted separately from this Proposal document (Bid Form) will not be accepted. If you desire to make changes in a Bid Item or a group of Bid Items just before the time for closing Bids, you may do so by filling out the Bid Price Adjustment page in this Proposal document (Bid Form) and depositing it with the Proposal (Bid). See Section 16 of these Instructions.

9. PROPOSAL (BID) GUARANTEE. Each Proposal (Bid) must be accompanied by a Proposal Guarantee (Bid Bond) in the amount of not less than **5%** of the amount Bid and guaranteeing that the Bidder will enter into a Contract in accordance with the terms of the Proposal documents (Bid Form), if award is made. The Proposal Guarantee (Bid Bond) shall be in one of the following forms: A bid bond written by an approved surety insurer on the form included with the proposal form, a cashier's check drawn by a national bank, a check certified by a national bank or cash. An electronically transmitted copy (PDF) of the Bid Bond form included in the Proposal documents (Bid Forms) may be used, but the Bid Bond form must have the original signatures of the Principal and Surety. A FAX of the completed Bid Bond form will not be accepted. Note: Performance and Payment Bonds will be required from the Bidder to whom a Contract is awarded. See FAA GENERAL CONTRACT PROVISIONS for Contract Bond requirements including limitations on the sureties that may issue the bonds.

10. SUBMITTING PROPOSAL (BID). Submit your Proposal (Bid) on one copy only of the Proposal document (Bid Form), with Addenda acknowledged by inserting the Addenda numbers on the last page of the Proposal document (Bid Form) along with the Proposal Guarantee (Bid Bond) included in the Proposal Forms section, in a sealed envelope addressed to:

County of Ventura: Department of Airports, Administration Office, Public Counter, 2nd Floor Lobby

The envelope must show the Project Title and the Bidder's name and address.

NOTE: All pages of the Proposal document (Bid Form) must be submitted. Do not return Plans and Specifications. Late Bids will not be opened or considered. Bids must be on the Proposal document (Bid Form) provided.

- **Important**: Proposal documents (Bid Forms) received that are not signed will not be considered.

11. TIME of BID CLOSURE. The Bid Box will be closed promptly at the time specified on the first sheet of the Proposal document (Bid Form). The person opening Proposals (Bids) will not accept Proposals (Bids) that are not in the Bid Box at closing time. The time used is local standard time as obtained from Pacific Telephone's Standard Time. The clock on the Public Counter will be set to local standard time and will govern closure of the Bid Box. Proposers or Bidders should note that other clocks in the building may not be set to the correct time and should not be relied upon.

12. DELIVERY of PROPOSAL (BID). Proposals (Bids) delivered in person must be placed in the **Bid Box at the Department of Airports (DOA), Administration Office, Public Counter, 2nd Floor Lobby, which is located at 555 Airport Way, Suite B, Camarillo, California 93010.** The DOA, Public Counter is located in the DOA Administration Office, which is at the Camarillo Airport. The Camarillo Airport is reached by taking the Las Posas exit off the 101 Freeway, proceed south to Pleasant Valley Road, turn right on Pleasant Valley Road and proceed to the 1st traffic light, turn right on Airport Way and proceed to the DOA administrative office (2 blocks on the left). Bids must be placed in the Bid Box prior to the hour and date designated on Page 1 of the Proposal document (Bid Form).

13. MAILED PROPOSAL (BID). Proposal (Bids) **should NOT** be mailed to 800 S. Victoria Avenue, Ventura, California. Proposals (Bids) received by the Department of Airports at 555 Airport Way, Suite B, Camarillo, California 93010 prior to 3:00 P.M. on the Bid Opening Date will be considered to have been placed in the Bid Box on time, whether or not actually delivered to the Bid Box on time. Special delivery mail will not assure timely delivery to the Agency and has, on occasion, slowed delivery. Registered and certified mail usually slows delivery. Bidder is responsible for mailing Proposal (Bid) early enough to ensure delivery to the Agency on time. Telegraphic Proposals (Bids) or modifications will not be considered.

14. WITHDRAWAL of PROPOSAL (BID). Proposals (Bids) may be withdrawn by the Proposer or Bidder, prior to the time stated for Bid Opening, upon written request, signed by the Proposer or Bidder or his authorized agent.

15. ERRORS. Proposer or Bidder will not be released on account of errors. Where a discrepancy occurs between a written amount and a number, the written amount shall govern. Where a discrepancy occurs between a Unit Price and Total, the Unit Price shall govern in computing the Total. If either a Unit Price or a Lump Sum amount are not listed in writing or are omitted, the Bid will be considered Non-Responsive in accordance with Paragraph 5 above. If the Total Bid Price is not equal to the sum of the Item Totals (as corrected), the Total Price Bid will be corrected. If no monetary symbol ($ or ¢) is entered with a Unit Price, Lump Sum or extension, a Dollar sign will be assumed to be the Proposer's or Bidder's intent.

16. BID ADJUSTMENT FORM. The Bid Price Adjustment form, if used, must be included with a fully-executed Proposal (Bid) or placed separately in the Bid Box into which a fully-executed Proposal (Bid) has already been placed. If the form is submitted separately, it shall be signed, show the proper Specification Number and be placed in the Bid Box prior to the time for Bid closure. If more than One (1) form is submitted, the latest form shall clearly indicate if it replaces or supplements the previous form(s).

When the Bid Price Adjustment Form is used and an adjustment is entered applying to more than one Bid Item, the adjusted Unit Prices will be computed as follows:

(a) The Unit Prices entered on the bid sheet will be multiplied by the numbers of units to get the line totals of the original bid. Corrections will be made as specified in above, if necessary.

(b) The increase or decrease specified on the Bid Price Adjustment Form will be applied to the line totals found in "a" above in the proportion that those line totals are to the sum of the group of line totals specified to be modified, rounding to the nearest $0.01.

(c) The modified Unit Prices will be computed by dividing the modified line totals found in "b" above by numbers of units, rounding to the nearest $0.001.

When an adjustment is to be applied to only one Bid Item, the adjusted Unit Price will be computed in the same manner except there will be no proportioning done in "b". The Bid Abstract and Contract will show adjusted prices.

17. FEDERAL REQUIREMENTS. This Project is funded in part by the Federal Aviation Administration (FAA) and is subject to extensive Federal Requirements for Bidding, Contracts, labor, and wages. The Proposer's or Bidder's attention is directed to the "FAA GENERAL CONTRACT PROVISIONS" and the "REQUIRED FEDERAL CONTRACT PROVISIONS" for detailed information on FAA Requirements.

18. DISADVANTAGED BUSINESS ENTERPRISE. There is *a* **DBE** project goal established for this Project ***of 5.00%.*** At this time, the County of Ventura will meet the DBE goal on Federally assisted projects through race neutral measures. The County of Ventura supports the use of race neutral measures to facilitate participation by DBE's and other small businesses and encourages Contractors to subcontract portions of their work that they might otherwise perform with their own forces in a Good Faith Effort to meet the DBE project goal. See the "Required Federal Contract Provisions" for more information on DBE requirements.

19. MINIMUM WAGE and CERTIFIED PAYROLL. Labor on this Project shall be paid no less than the greater of the minimum Prevailing Rates of Wages established by the U.S. Secretary of Labor or by the State of California, Department of Industrial Relations.

1) Federal wage determinations issued under the Davis-Bacon and related Acts are available electronically at no cost at https://beta.sam.gov/. The bidder may contact the Director of the Department of Industrial Relations, phone number (415) 703-4774 or www.dir.ca.gov/dlsr/PWD (website), to obtain a schedule of the State general prevailing wages applicable to the location and work to be done. The Contractor and the Contractor's subcontractors are responsible for compliance with the requirements of Section 1777.5 and 1777.6 of the Labor Code of the State of California regarding employment of apprentices.

2) The Contractor shall submit two (2) copies of all certified payroll, including subcontractors, to the Engineer and State of California, each month. Failure to submit complete certified payroll in a timely manner may delay progress payments. For certified payroll to be considered for review, the submittal must contain the necessary information in a clear, logical manner. Refer to "Required Federal Contract Provisions." (Contractors are responsible for also submitting certified payroll records to the Labor Commissioner Using DIR's electronic certified payroll reporting system http://www.dir.ca.gov/Public-Works/Certified-Payroll-Reporting.html

20. LIST OF SUBCONTRACTORS:

A. Pursuant to the provisions of Section 4100 through 4114 of the Public Contract Code of the State of California all Proposals (Bids) shall be accompanied by a List of Subcontractors that the Proposer or Bidder proposes to use who will perform work or labor or render service to the Proposer or Bidder in excess of one- half of one percent of the Proposer's or Bidder's total bid or $10,000, whichever is greater. The names, principal business address, license number, and portion of work that will be done by each Subcontractor shall be submitted on the form, which is furnished in the Proposal (Bid) Forms of this Contract Documents Book.

B. Proposer or Bidder shall be solely responsible to correct any errors in the listing of the California Contractor's license number.

C. A deadline of 24 hours after Proposal (Bid) opening is established by which a Proposer or Bidder must submit corrected California Contractor's license number information to the Agency.

D. A Proposer's or Bidder's failure to submit corrected California Contractor's license numbers will cause the Proposal (Bid) to be non-responsive.

E. If the Proposer or Bidder fails to specify a Subcontractor for any portion of the work to be performed under the Contract in excess of one-half of one percent of the Proposer's or Bidder's total bid, the Proposer or Bidder agrees to perform that portion itself. The successful Proposer or Bidder shall not, without the consent of the Agency either:

   1) Substitute any person, firm, or corporation as subcontractor in place of the Subcontractor designated in the original Proposal (Bid); or

   2) Permit any Subcontractor to be assigned or transferred or allow it to be performed by anyone other than the original Subcontractor listed in the bid.

21. DRUG-FREE WORKPLACE. This Project / Contract is covered by the Drug-Free Workplace Act of 1988; Contractor will be required to provide and maintain, at all times, a drug-free workplace.

22. BUY AMERICAN REQUIREMENTS FOR FAA-FUNDED ITEMS. The bid items in this project will be funded by the FAA. The materials associated with each item shall meet the Buy American Preferences as detailed in Section A4 of the Required Federal Contract Provisions. Documentation for Buy American preferences (or Buy American waiver) is required during the Mobilization Element for submittals as detailed in Project Specific Requirements for Airport Construction section of these specifications.

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Proposal Forms

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BIDDER'S CHECK LIST
for
OXNARD AIRPORT RUNWAY 7-25, TAXIWAY CONNECTORS,
AND PARALLEL TAXIWAY PAVEMENT REHABILITATION

PROPOSAL (BID): Each bidder shall complete the Proposal (Bid) and all forms included in its entirety and sign and date.

The forms included in the "PROPOSAL (BID)" which must be submitted with bid are as follows:

- ☐ BIDDER'S CHECKLIST
- ☐ PROPOSAL COVER SHEET
- ☐ BID SCHEDULE OF WORK ITEMS
  Each bidder shall complete the bid schedule in its entirety. Prices in the bid schedule must be shown in the spaces provided and must be expressed in both words and figures. Where conflict occurs, written or typed words shall prevail.
- ☐ ACKNOWLEDGMENT OF ADDENDA (located at end of Bid Schedule)
  Each bidder shall acknowledge receipt of all addendum on the proposal.
- ☐ BID PRICE ADJUSTMENTS (if used)
- ☐ NON-COLLUSION AFFIDAVIT
- ☐ ASSURANCE OF COMPLIANCE - DBE UTILIZATION;
  Submit good faith efforts if unable to meet DBE goal
- ☐ LIST OF DBE SUB-CONTRACTORS AND MATERIAL SUPPLIERS
- ☐ CERTIFICATION OF AFFIRMATIVE ACTION PROGRAM
- ☐ CERTIFICATION OF PROHIBITION OF SEGREGATED FACILITIES
- ☐ BIDDER'S STATEMENT OF PREVIOUS CONTRACTS SUBJECT TO EEO CLAUSE
- ☐ SUSPENSION AND DEBARMENT REQUIREMENTS
- ☐ CERTIFICATION ON NON-LOBBYING ACTIVITIES
- ☐ PUBLIC CONTRACT CODES
- ☐ CERTIFICATION REGARDING FOREIGN TRADE RESTRICTIONS
- ☐ BUY AMERICAN CERTIFICATION
- ☐ LIST OF SUBCONTRACTORS AND OFF-JOB FABRICATORS

- ☐ CERTIFICATION OF OFFERER/BIDDER REGARDING TAX DELINQUENCY AND FELONY CONVICTIONS
- ☐ DRUG-FREE WORKPLACE CERTIFICATION
- ☐ BID BOND (OF 5%)
  Each bidder shall submit with bid, cash, certified check, cashier's check, or bid bond (Surety bond) in the amount not less than 5% of the Total Bid.
- ☐ STATEMENT OF BIDDERS QUALIFICATIONS
- ☐ KEY PERSONNEL
  Eac*h bidder shall submit with bid a list with their Key Personnel and their resume per SP-106.*
- ☐ CRITICAL PATH SCHEDULE
  Eac*h bidder shall submit with bid a Critical Path Method (CPM) schedule per SP-107 for each award type using the Project elements identified on the CSPP.*
  1. *Base Bid (Schedule A) + Base Bid Transition (Schedule B)*
  2. *Base Bid (Schedule A) + Bid Alternate 1 (Schedule C) + Bid Alternate 1 Transition (Schedule D)*
  3. *Base Bid (Schedule A) + Bid Alternate 1 (Schedule C) + Bid Alternate 2 (Schedule E)*

Successful Bidder's attention is called to the following forms, which must be completed in full as required:

- ☐ PAYMENT BOND, *100% of Contract Amount (Prior to the Contract Award)*
- ☐ PERFORMANCE BOND, *100% of Contract Amount (Prior to the Contract Award)*
- ☐ DBE SUBCONTRACTOR LETTER OF INTENT *(Within 10 Calendar Days from bid Opening, if requested)*
- ☐ SUBCONTRACTOR'S STATEMENT OF PREVIOUS CONTRACTS SUBJECT TO EEO CLAUSE *(Prior to issuance of Notice to Proceed for Mobilization).*

PROPOSAL (BID)
FOR
OXNARD AIRPORT

RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT RECONSTRUCTION

LOCATED IN VENTURA COUNTY, CALIFORNIA

MAKE PROPOSAL (BID) GUARANTEE TO **COUNTY OF VENTURA**.
USE FORM PROVIDED (SEE PARAGRAPH 10, INSTRUCTION TO BIDDERS).

SPECIFICATION NO. **DOA 20-02** INCLUDING **243** SHEETS OF PLANS.

THERE WILL BE A **PRE-BID CONFERENCE** ON **APRIL 6, 2021** AT **10:00 A.M.** AT THE LOCATION IDENTIFIED IN THE NOTICE INVITING BIDS. BIDS WILL BE RECEIVED ON **APRIL 29, 2021** AT **3:00 P.M.**, AT THE DEPARTMENT OF AIRPORTS – ADMINISTRATION OFFICE – PUBLIC COUNTER: 2ND FLOOR LOBBY, 555 AIRPORT WAY, SUITE B, CAMARILLO, CA 93010.

AGENCY IS ALLOWED **120 CALENDAR DAYS** TO AWARD A CONTRACT.

THE STARTING DATE OF CONTRACT WILL BE **30 CALENDAR DAYS** AFTER AWARD OF CONTRACT (SEE FAA GENERAL PROVISIONS SECTIONS 30-06 & 80-02, and VCSS-DOA SECTION 6-7.4).

CONTRACT TIME IS **161 DAYS** FOR COMPLETION OF ALL WORK INCLUDING ALL BID ALTERNATES (SEE GENERAL REQUIREMENTS FOR AIRPORT CONSTRUCTION).

LIQUIDATED DAMAGES **- $500 PER CALENDAR DAY** WILL BE ASSESSED FOR FAILURE TO COMPLETE THE **MOBILIZATION ELEMENT PHASE 1** WITHIN THE TIMELINES SPECIFIED; **$9,000 PER CALENDAR DAY** WILL BE ASSESSED FOR FAILURE TO COMPLETE THE **CONSTRUCTION ELEMENT** OF THE PROJECT **OR THE OVERALL PROJECT** WITHIN THE CONTRACT TIME ALLOWED.

CONTRACTOR's LICENSE CLASSIFICATION REQUIRED: **"A"**

LIABILITY INSURANCE CLASS REQUIRED PER VCSS-DOA SECTION 7-4.2 IS **L-D.**
FEDERAL-AID CONTRACT PROVISIONS **ARE INCLUDED** IN THESE SPECIFICATIONS.

THE NUMBER OF PAGES IN THIS PROPOSAL IS **62.**

BIDDER SHALL COMPLETE

NAME: _____

ADDRESS: _____

CITY: _____ STATE: _____ ZIP CODE: _____

PHONE No.: _____ FAX No.: _____

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE A - BASE BID

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
1	C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1			
2	C-105.1	Mobilization	LS	1			
3	C-105.2	Resident Project Engineer's Field Office	LS	1			
4	SP-102-3.1	Compliance with Pollution, Erosion, and Siltation Control	LS	1			
5	SP-100-3.1	Airfield Safety and Traffic Control	LS	1			
6	SP-100-3.2	Construction Staking and Survey Layout	LS	1			
7	SP-100-3.3	Airport Access and Haul Route Repair	SY	2,000			
8	SP-100-3.8	Underground Utility Investigation and Potholing	HOUR	16			
9	P-101-5.1	Demolish Asphalt Pavement	SY	68,500			
10	SP-126-4.1	Remove and Salvage REILs. Demolish PCC Foundation	SET	1			
11	SP-126-4.2a	Demolish Conduit, Cable, and Counterpoise	LF	1,000			
PAGE SUBTOTAL IN FIGURES (ITEMS 1-11)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE A - BASE BID

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
12	SP-126-4.2b	Demolish Concrete Encased Conduit, Cable, and Counterpoise	LF	460			
13	SP-126-4.3	Remove Cable and Counterpoise	LF	10,800			
14	SP-126-4.6	Demolish Electrical Junction Can	EA	2			
15	SP-126-4.7b	Demolish FAA Pullbox	EA	2			
16	SP-126-4.8	Demolish Airfield Sign and Pad	EA	5			
17	SP-126-4.9b	Remove and Salvage Elevated Runway Edge Light Fixture and Transformer. Protect Can.	EA	53			
18	SP-126-4.9c	Remove and Salvage Elevated Threshold Light Fixture and Transformer. Protect Can.	EA	24			
19	SP-126-4.13	Demolish MALSF Threshold Bar (13 Lights). Salvage Existing Fixtures.	EA	1			
20	SP-126-4.14	Demolish MALSF Centerline Bar (5 Lights). Salvage Existing Fixtures.	EA	3			
21	SP-126-4.15	Demolish Reinforced Concrete Foundation from Abandoned MALSF Bars	LS	1			
22	SP-126-4.17	Demolish Abandoned Waterline, if Encountered	LF	410			
PAGE SUBTOTAL IN FIGURES (ITEMS 12-22)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE A - BASE BID

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
23	P-152-4.1	Unclassified Excavation and Haul-off	CY	18,500			
24	P-152-4.2	Embankment in Place	CY	13,500			
25	P-152-4.3	Subgrade Preparation	SY	94,100			
26	SP-100-3.7	Place Asphalt Compacted Grindings, 24-inches thick	SY	8,300			
27	P-155-8.1	Lime Treated Subgrade, 16-Inch Depth	SY	72,500			
28	SP-100-3.4	In-place Drying Techniques	SY	7,300			
29	SP-100-3.5	Subgrade Stabilization, Excavation Below Subgrade	CY	1,500			
30	SP-100-3.6	Multi-axial Geogrid	SY	2,200			
31	P-209-5.1	Crushed Aggregate Base Course, P-209	CY	25,900			
32	P-401-8.1	Asphalt Concrete Surface Course, P-401	TON	17,100			
33	P-621-5.1	Grooving	SY	52,700			
PAGE SUBTOTAL IN FIGURES (ITEMS 23-33)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE A - BASE BID

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
34	SP-100-3.9	Install Runway Threshold Survey Monument	EA	2			
35	SP-100-3.10	Install Checkpoint Markers	LS	1			
36	D-701-5.1	12-inch RCP, Class IV, outside Pavement Areas	LF	750			
37	D-701-5.2	12-inch RCP, Class IV, within Pavement Areas	LF	190			
38	D-705-5.1	Underdrain Pipe, 6-Inch, Perforated	LF	11,300			
39	D-705-5.2	Underdrain Pipe Cleanout	EA	27			
40	D-751-5.1	48" Stormdrain Manhole	EA	17			
41	D-751-5.3	Adjust Catch Basin to Grade	EA	2			
42	D-751-5.4	Connect to Existing Manhole/Basin	EA	10			
43	P-153-6.1	Controlled Low-Strength Material (CLSM) for Existing Utility Protection	CY	50			
44	L-108-5.1	No. 8 AWG 5 kV, L-824, Type C Cable, Installed in Duct Bank or Conduit	LF	12,000			
PAGE SUBTOTAL IN FIGURES (ITEMS 34-44)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE A - BASE BID

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
45	L-108-5.2a	No. 6 AWG Bare Counterpoise Wire, Installed Adjacent to / In the Duct Bank or Conduit	LF	10,600			
46	L-108-5.2b	No. 1/0 AWG Bare Counterpoise Wire for MALSF, Installed Adjacent to / In the Duct Bank or Conduit	LF	1,200			
47	L-108-5.3a	No. 4/0 AWG 600V, L-824, Type THWN-2 Cable for MALSF, Installed in Duct Bank or Conduit	LF	2,900			
48	L-108-5.3b	No. 4 AWG 600V, L-824, Type THWN-2 Cable for MALSF, Installed in Duct Bank or Conduit	LF	2,900			
49	L-108-5.3c	No. 6 AWG 600V, L-824, Type THWN-2 Cable for MALSF, Installed in Duct Bank or Conduit	LF	3,200			
50	L-108-5.3d	No. 2 AWG 600V, L-824, Type THWN-2 Cable for MALSF, Installed in Duct Bank or Conduit	LF	400			
51	L-110-5.4	Concrete-Encased Electrical Duct Bank, 1W - 2" RGS Conduit	LF	210			
52	L-110-5.5	Non-encased Electrical Duct Bank, 1W - 2" Conduit	LF	170			
53	L-110-5.8b	Non-encased Electrical Duct Bank, 1W - 3" and 2W - 2" Conduit	LF	380			
54	L-110-5.8c	Non-encased Electrical Duct Bank, 1W - 3" and 3W - 2" Conduit	LF	140			
PAGE SUBTOTAL IN FIGURES (ITEMS 45-54)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE A - BASE BID

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
55	L-115-5.1b	Construct FAA Pull Box	EA	2			
56	L-115-5.1c	Construct Junction Can: L-868 with Lid	EA	4			
57	L-115-5.1d	Adjust Junction Can to Grade	EA	1			
58	L-115-5.3a	Construct MALSF Threshold Bar	EA	1			
59	L-115-5.3b	Construct MALSF Centerline Bar	EA	3			
60	L-125-5.1a	Construct New L-858B(L) Distance Remaining Sign and Concrete Pad	EA	4			
61	L-125-5.4a	Install New L-861(L) Elevated Runway Edge Light and Adjust Existing Base Can	EA	44			
62	L-125-5.4b	Install New L-861(L) Elevated Runway Edge Light on Existing Base Can	EA	9			
63	L-125-5.6a	Install New L-861E(L) Runway Threshold Light and Transformer and Adjust Existing Base Can	EA	18			
64	L-125-5.6b	Install New L-861E(L) Runway Threshold Light and Transformer on Existing Base Can	EA	6			
65	L-125-5.12	Install ID Tag	EA	77			
PAGE SUBTOTAL IN FIGURES (ITEMS 55-65)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE A - BASE BID

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
66	L-125-5.13	Install Salvaged REILs on New Concrete Pad	SET	1			
67	L-125-5.15a	Miscellaneous Lighting Equipment for Runway	LS	1			
68	P-620-5.2a	Marking, 2 Coats with Beads (All Colors)	SF	78,300			
69	P-620-5.2b	Marking, 2 Coats with No Beads (All Colors)	SF	2,000			
70	P-620-5.2c	Marking, Single Coat with No Beads (All Colors)	SF	24,000			
71	T-901-5.1	Seeding	AC	3			
72	CVSS-DOA 9-4	Execution of Release on Contract	LS	1			
PAGE SUBTOTAL IN FIGURES (ITEMS 66-72)						$	
TOTAL BID SCHEDULE A IN FIGURES						$	
TOTAL BID SCHEDULE A IN WORDS:							

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE B - BASE BID TRANSITION

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
1	C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1			
2	C-105.1	Mobilization	LS	1			
3	C-105.2	Resident Project Engineer's Field Office	LS	1			
4	SP-102-3.1	Compliance with Pollution, Erosion, and Siltation Control	LS	1			
5	SP-100-3.1	Airfield Safety and Traffic Control	LS	1			
6	SP-100-3.2	Construction Staking and Survey Layout	LS	1			
7	P-101-5.2	Asphalt Crack Repair (under 1.5" width)	LF	6,100			
8	P-101-5.3	Asphalt Crack Repair (over 1.5" width)	SF	400			
9	P-101-5.4	Remove Pavement Markings	SF	500			
10	P-101-5.6	Cold Mill, Variable Depth (2 inches Maximum)	SY	8,200			
11	SP-126-4.3	Remove Cable and Counterpoise	LF	7,100			
PAGE SUBTOTAL IN FIGURES (ITEMS 1-11)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE B - BASE BID TRANSITION

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
12	SP-126-4.8	Demolish Airfield Sign and Pad	EA	8			
13	SP-126-4.9a	Remove and Salvage Elevated Taxiway Edge Light Fixture and Transformer. Protect Can.	EA	31			
14	SP-126-4.9b	Remove and Salvage Elevated Runway Edge Light Fixture and Transformer. Protect Can.	EA	2			
15	SP-126-4.10	Remove and Salvage In-pavement Runway Edge Light Fixture and Transformer. Protect Can.	EA	3			
16	P-152-4.1	Unclassified Excavation and Haul-off	CY	1,000			
17	P-152-4.2	Embankment in Place	CY	300			
18	P-152-4.3	Subgrade Preparation	SY	3,100			
19	P-209-5.1	Crushed Aggregate Base Course, P-209	CY	1,200			
20	P-401-8.1	Asphalt Concrete Surface Course, P-401	TON	2,000			
21	D-751-5.3	Adjust Catch Basin to Grade	EA	1			
PAGE SUBTOTAL IN FIGURES (ITEMS 12-21)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE B - BASE BID TRANSITION

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
22	L-108-5.1	No. 8 AWG 5 kV, L-824, Type C Cable, Installed in Duct Bank or Conduit	LF	11,700			
23	L-108-5.2a	No. 6 AWG Bare Counterpoise Wire, Installed Adjacent to / In the Duct Bank or Conduit	LF	3,500			
24	L-110-5.5	Non-encased Electrical Duct Bank, 1W - 2" Conduit	LF	120			
25	L-115-5.2a	Adjust Electrical Pullbox to Grade	EA	2			
26	L-125-5.1d	Construct New L-858(L) Airfield Guidance Sign (A3) and Concrete Pad	EA	1			
27	L-125-5.1g	Construct New L-858(L) Airfield Guidance Sign (B3) and Concrete Pad	EA	1			
28	L-125-5.1h	Construct New L-858(L) Airfield Guidance Sign (B4) and Concrete Pad	EA	1			
29	L-125-5.1k	Construct New L-858(L) Airfield Guidance Sign (C3) and Concrete Pad	EA	1			
30	L-125-5.1l	Construct New L-858(L) Airfield Guidance Sign (C4) and Concrete Pad	EA	1			
31	L-125-5.1o	Construct New L-858(L) Airfield Guidance Sign (D3) and Concrete Pad	EA	1			
PAGE SUBTOTAL IN FIGURES (ITEMS 22-31)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE B - BASE BID TRANSITION

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
32	L-125-5.1p	Construct New L-858(L) Airfield Guidance Sign (D4) and Concrete Pad	EA	1			
33	L-125-5.4a	Install New L-861(L) Elevated Runway Edge Light and Adjust Existing Base Can	EA	2			
34	L-125-5.5	Install New L-852D(L) In-Pavement Runway Edge Light and Adjust Existing Base Can	EA	3			
35	L-125-5.11	Install Salvaged Elevated Taxiway Edge Light and Transformer on Existing Base Can	EA	32			
36	L-125-5.12	Install ID Tag	EA	37			
37	P-620-5.2a	Marking, 2 Coats with Beads (All Colors)	SF	3,200			
38	P-620-5.2c	Marking, Single Coat with No Beads (All Colors)	SF	7,900			
39	P-620-5.2d	Marking, Single Coat with Beads (All Colors)	SF	1,500			
40	T-901-5.1	Seeding	AC	1			
PAGE SUBTOTAL IN FIGURES (ITEMS 32-40)						$	
TOTAL BID SCHEDULE B IN FIGURES						$	
TOTAL BID SCHEDULE B IN WORDS:							

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE C - BID ALTERNATE 1

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
1	C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1			
2	C-105.1	Mobilization	LS	1			
3	C-105.2	Resident Project Engineer's Field Office	LS	1			
4	SP-102-3.1	Compliance with Pollution, Erosion, and Siltation Control	LS	1			
5	SP-100-3.1	Airfield Safety and Traffic Control	LS	1			
6	SP-100-3.2	Construction Staking and Survey Layout	LS	1			
7	SP-100-3.8	Underground Utility Investigation and Potholing	HOUR	12			
8	P-101-5.1	Demolish Asphalt Pavement	SY	16,200			
9	SP-126-4.2a	Demolish Conduit, Cable, and Counterpoise	LF	7,900			
10	SP-126-4.2b	Demolish Concrete Encased Conduit, Cable, and Counterpoise	LF	400			
11	SP-126-4.3	Remove Cable and Counterpoise	LF	200			
PAGE SUBTOTAL IN FIGURES (ITEMS 1-11)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE C - BID ALTERNATE 1

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
12	SP-126-4.7a	Demolish Electrical Pullbox	EA	13			
13	SP-126-4.7b	Demolish FAA Pullbox	EA	1			
14	SP-126-4.8	Demolish Airfield Sign and Pad	EA	18			
15	SP-126-4.11a	Demolish Elevated Taxiway Edge Light and Can. Salvage Existing Fixture.	EA	55			
16	SP-126-4.11b	Demolish Elevated Runway Edge Light and Can. Salvage Existing Fixture.	EA	2			
17	SP-126-4.12b	Demolish In-pavement Runway Edge Light and Can. Salvage Existing Fixture.	EA	3			
18	SP-126-4.17	Demolish Abandoned Waterline, if Encountered	LF	220			
19	P-152-4.1	Unclassified Excavation and Haul-off	CY	5,500			
20	P-152-4.2	Embankment in Place	CY	2,500			
21	P-152-4.3	Subgrade Preparation	SY	17,600			
22	P-155-8.1	Lime Treated Subgrade, 16-Inch Depth	SY	11,400			
PAGE SUBTOTAL IN FIGURES (ITEMS 12-22)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE C - BID ALTERNATE 1

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
23	SP-100-3.4	In-place Drying Techniques	SY	1,200			
24	SP-100-3.5	Subgrade Stabilization, Excavation Below Subgrade	CY	300			
25	SP-100-3.6	Multi-axial Geogrid	SY	400			
26	P-209-5.1	Crushed Aggregate Base Course, P-209	CY	5,400			
27	P-401-8.1	Asphalt Concrete Surface Course, P-401	TON	2,600			
28	P-621-5.1	Grooving	SY	2,500			
29	D-701-5.1	12-inch RCP, Class IV, outside Pavement Areas	LF	120			
30	D-705-5.1	Underdrain Pipe, 6-Inch, Perforated	LF	3,100			
31	D-705-5.2	Underdrain Pipe Cleanout	EA	32			
32	D-751-5.1	48" Stormdrain Manhole	EA	3			
33	D-751-5.2	Catch Basin/Drop Inlet	EA	1			
PAGE SUBTOTAL IN FIGURES (ITEMS 23-33)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE C - BID ALTERNATE 1

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
34	D-751-5.4	Connect to Existing Manhole/Basin	EA	2			
35	P-153-6.1	Controlled Low-Strength Material (CLSM) for Existing Utility Protection	CY	120			
36	L-108-5.1	No. 8 AWG 5 kV, L-824, Type C Cable, Installed in Duct Bank or Conduit	LF	12,800			
37	L-108-5.2a	No. 6 AWG Bare Counterpoise Wire, Installed Adjacent to / In the Duct Bank or Conduit	LF	4,700			
38	L-110-5.1	Concrete Encased Electrical Duct Bank, 1W - 2" Conduit	LF	550			
39	L-110-5.2	Concrete Encased Electrical Duct Bank, 3W - 2" Conduit	LF	490			
40	L-110-5.5	Non-encased Electrical Duct Bank, 1W - 2" Conduit	LF	1,200			
41	L-110-5.6	Non-encased Electrical Duct Bank, 2W - 2" Conduit	LF	2,700			
42	L-110-5.9	Concrete Encase Existing FAA Line Under Proposed Pavement	LF	250			
43	L-110-5.10	Concrete Encase Existing FAA Line Outside Pavement	LF	40			
44	L-115-5.1a	Construct Electrical Pullbox: Aircraft Rated	EA	10			
PAGE SUBTOTAL IN FIGURES (ITEMS 34-44)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE C - BID ALTERNATE 1

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
45	L-115-5.1b	Construct FAA Pull Box	EA	1			
46	L-115-5.1c	Construct Junction Can: L-868 with Lid	EA	3			
47	L-125-5.1b	Construct New L-858(L) Airfield Guidance Sign (A1) and Concrete Pad	EA	1			
48	L-125-5.1c	Construct New L-858(L) Airfield Guidance Sign (A2) and Concrete Pad	EA	1			
49	L-125-5.1d	Construct New L-858(L) Airfield Guidance Sign (A3) and Concrete Pad	EA	1			
50	L-125-5.1e	Construct New L-858(L) Airfield Guidance Sign (B1) and Concrete Pad	EA	1			
51	L-125-5.1f	Construct New L-858(L) Airfield Guidance Sign (B2) and Concrete Pad	EA	1			
52	L-125-5.1g	Construct New L-858(L) Airfield Guidance Sign (B3) and Concrete Pad	EA	1			
53	L-125-5.1h	Construct New L-858(L) Airfield Guidance Sign (B4) and Concrete Pad	EA	1			
54	L-125-5.1i	Construct New L-858(L) Airfield Guidance Sign (C1) and Concrete Pad	EA	1			
55	L-125-5.1j	Construct New L-858(L) Airfield Guidance Sign (C2) and Concrete Pad	EA	1			
PAGE SUBTOTAL IN FIGURES (ITEMS 45-55)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE C - BID ALTERNATE 1

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
56	L-125-5.1k	Construct New L-858(L) Airfield Guidance Sign (C3) and Concrete Pad	EA	1			
57	L-125-5.1l	Construct New L-858(L) Airfield Guidance Sign (C4) and Concrete Pad	EA	1			
58	L-125-5.1m	Construct New L-858(L) Airfield Guidance Sign (D1) and Concrete Pad	EA	1			
59	L-125-5.1n	Construct New L-858(L) Airfield Guidance Sign (D2) and Concrete Pad	EA	1			
60	L-125-5.1o	Construct New L-858(L) Airfield Guidance Sign (D3) and Concrete Pad	EA	1			
61	L-125-5.1p	Construct New L-858(L) Airfield Guidance Sign (D4) and Concrete Pad	EA	1			
62	L-125-5.1q	Construct New L-858(L) Airfield Guidance Sign (E1) and Concrete Pad	EA	1			
63	L-125-5.1r	Construct New L-858(L) Airfield Guidance Sign (E2) and Concrete Pad	EA	1			
64	L-125-5.1s	Construct New L-858(L) Airfield Guidance Sign (E3) and Concrete Pad	EA	1			
65	L-125-5.7	Construct New L-861(L) Elevated Runway Edge Light and Base Can	EA	2			
66	L-125-5.8	Construct New L-852D(L) In-Pavement Runway Edge Light and Base Can	EA	3			
PAGE SUBTOTAL IN FIGURES (ITEMS 56-66)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE C - BID ALTERNATE 1

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
67	L-125-5.9	Construct New L-861T(L) Medium Intensity Elevated Taxiway Edge Light and Base Can	EA	58			
68	L-125-5.12	Install ID Tag	EA	63			
69	L-125-5.14	Change Sign Legend	EA	18			
70	L-125-5.15b	Miscellaneous Lighting Equipment for Taxiways	LS	1			
71	P-620-5.2a	Marking, 2 Coats with Beads (All Colors)	SF	5,400			
72	P-620-5.2c	Marking, Single Coat with No Beads (All Colors)	SF	9,100			
73	T-901-5.1	Seeding	AC	5			
PAGE SUBTOTAL IN FIGURES (ITEMS 67-73)						$	
TOTAL BID SCHEDULE C IN FIGURES						$	
TOTAL BID SCHEDULE C IN WORDS:							

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE D - BID ALTERNATE 1 TRANSITION

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
1	C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1			
2	C-105.1	Mobilization	LS	1			
3	C-105.2	Resident Project Engineer's Field Office	LS	1			
4	SP-102-3.1	Compliance with Pollution, Erosion, and Siltation Control	LS	1			
5	SP-100-3.1	Airfield Safety and Traffic Control	LS	1			
6	SP-100-3.2	Construction Staking and Survey Layout	LS	1			
7	P-101-5.1	Demolish Asphalt Pavement	SY	4,300			
8	P-101-5.2	Asphalt Crack Repair (under 1.5" width)	LF	1,200			
9	P-101-5.3	Asphalt Crack Repair (over 1.5" width)	SF	100			
10	P-101-5.4	Remove Pavement Markings	SF	2,400			
11	P-101-5.6	Cold Mill, Variable Depth (2 inches Maximum)	SY	1,600			
PAGE SUBTOTAL IN FIGURES (ITEMS 1-11)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE D - BID ALTERNATE 1 TRANSITION

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
12	SP-126-4.2a	Demolish Conduit, Cable, and Counterpoise	LF	1,200			
13	SP-126-4.2b	Demolish Concrete Encased Conduit, Cable, and Counterpoise	LF	500			
14	SP-126-4.3	Remove Cable and Counterpoise	LF	1,100			
15	SP-126-4.4	Remove and Salvage Unlit Information Sign	EA	1			
16	SP-126-4.5	Remove and Salvage Unlit Information Sign. Demolish Concrete Pad	EA	1			
17	SP-126-4.7a	Demolish Electrical Pullbox	EA	1			
18	SP-126-4.8	Demolish Airfield Sign and Pad	EA	3			
19	SP-126-4.11a	Demolish Elevated Taxiway Edge Light and Can. Salvage Existing Fixture.	EA	16			
20	SP-126-4.12a	Demolish In-pavement Taxiway Edge Light and Can. Salvage Existing Fixture.	EA	6			
21	SP-126-4.17	Demolish Abandoned Waterline, if Encountered	LF	40			
22	P-152-4.1	Unclassified Excavation and Haul-off	CY	1,800			
PAGE SUBTOTAL IN FIGURES (ITEMS 12-22)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE D - BID ALTERNATE 1 TRANSITION

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
23	P-152-4.2	Embankment in Place	CY	500			
24	P-152-4.3	Subgrade Preparation	SY	6,500			
25	P-155-8.1	Lime Treated Subgrade, 16-Inch Depth	SY	4,400			
26	SP-100-3.4	In-place Drying Techniques	SY	500			
27	SP-100-3.5	Subgrade Stabilization, Excavation Below Subgrade	CY	100			
28	SP-100-3.6	Multi-axial Geogrid	SY	200			
29	P-209-5.1	Crushed Aggregate Base Course, P-209	CY	2,000			
30	P-401-8.1	Asphalt Concrete Surface Course, P-401	TON	1,300			
31	P-621-5.1	Grooving	SY	200			
32	D-701-5.1	12-inch RCP, Class IV, outside Pavement Areas	LF	60			
33	D-705-5.1	Underdrain Pipe, 6-Inch, Perforated	LF	1,000			
PAGE SUBTOTAL IN FIGURES (ITEMS 23-33)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE D - BID ALTERNATE 1 TRANSITION

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
34	D-705-5.2	Underdrain Pipe Cleanout	EA	12			
35	D-751-5.4	Connect to Existing Manhole/Basin	EA	1			
36	P-153-6.1	Controlled Low-Strength Material (CLSM) for Existing Utility Protection	CY	100			
37	L-108-5.1	No. 8 AWG 5 kV, L-824, Type C Cable, Installed in Duct Bank or Conduit	LF	5,100			
38	L-108-5.2a	No. 6 AWG Bare Counterpoise Wire, Installed Adjacent to / In the Duct Bank or Conduit	LF	2,300			
39	L-110-5.1	Concrete Encased Electrical Duct Bank, 1W - 2" Conduit	LF	560			
40	L-110-5.5	Non-encased Electrical Duct Bank, 1W - 2" Conduit	LF	1,140			
41	L-110-5.6	Non-encased Electrical Duct Bank, 2W - 2" Conduit	LF	30			
42	L-110-5.7	Non-encased Electrical Duct Bank, 3W - 2" Conduit	LF	200			
43	L-110-5.9	Concrete Encase Existing FAA Line Under Proposed Pavement	LF	110			
44	L-115-5.1a	Construct Electrical Pullbox: Aircraft Rated	EA	1			
PAGE SUBTOTAL IN FIGURES (ITEMS 34-44)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE D - BID ALTERNATE 1 TRANSITION

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
45	L-115-5.1c	Construct Junction Can: L-868 with Lid	EA	2			
46	L-125-5.1u	Construct New L-858(L) Airfield Guidance Sign (F2) and Concrete Pad	EA	1			
47	L-125-5.1x	Construct New L-858(L) Airfield Guidance Sign (F5) and Concrete Pad	EA	1			
48	L-125-5.1z	Construct New L-858(L) Airfield Guidance Sign (F7) and Concrete Pad	EA	1			
49	L-125-5.2	Install Salvaged Unlit Informational Sign on Existing Concrete Pad	EA	1			
50	L-125-5.3	Install Salvaged Unlit Informational Sign on New Concrete Pad	EA	1			
51	L-125-5.9	Construct New L-861T(L) Medium Intensity Elevated Taxiway Edge Light and Base Can	EA	21			
52	L-125-5.10	Construct New L-852T(L) Medium Intensity In-Pavement Taxiway Edge Light and Base Can	EA	13			
53	L-125-5.12	Install ID Tag	EA	34			
PAGE SUBTOTAL IN FIGURES (ITEMS 45-53)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE D - BID ALTERNATE 1 TRANSITION

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
54	L-125-5.14	Change Sign Legend	EA	8			
55	P-620-5.2a	Marking, 2 Coats with Beads (All Colors)	SF	5,100			
56	P-620-5.2c	Marking, Single Coat with No Beads (All Colors)	SF	5,500			
57	T-901-5.1	Seeding	AC	1			
PAGE SUBTOTAL IN FIGURES (ITEMS 54-57)						$	
TOTAL BID SCHEDULE D IN FIGURES						$	
TOTAL BID SCHEDULE D IN WORDS:							

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE E - BID ALTERNATE 2

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
1	C-100-14.1	Contractor Quality Control Program (CQCP)	LS	1			
2	C-105.1	Mobilization	LS	1			
3	C-105.2	Resident Project Engineer's Field Office	LS	1			
4	SP-102-3.1	Compliance with Pollution, Erosion, and Siltation Control	LS	1			
5	SP-100-3.1	Airfield Safety and Traffic Control	LS	1			
6	SP-100-3.2	Construction Staking and Survey Layout	LS	1			
7	SP-100-3.8	Underground Utility Investigation and Potholing	HOUR	24			
8	P-101-5.1	Demolish Asphalt Pavement	SY	90,700			
9	P-101-5.2	Asphalt Crack Repair (under 1.5" width)	LF	2,100			
10	P-101-5.3	Asphalt Crack Repair (over 1.5" width)	SF	200			
11	P-101-5.4	Remove Pavement Markings	SF	14,800			
PAGE SUBTOTAL IN FIGURES (ITEMS 1-11)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE E - BID ALTERNATE 2

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
12	P-101-5.6	Cold Mill, Variable Depth (2 inches Maximum)	SY	2,800			
13	SP-126-4.2a	Demolish Conduit, Cable, and Counterpoise	LF	6,400			
14	SP-126-4.2b	Demolish Concrete Encased Conduit, Cable, and Counterpoise	LF	6,500			
15	SP-126-4.3	Remove Cable and Counterpoise	LF	400			
16	SP-126-4.4	Remove and Salvage Unlit Information Sign	EA	1			
17	SP-126-4.5	Remove and Salvage Unlit Information Sign. Demolish Concrete Pad	EA	1			
18	SP-126-4.7a	Demolish Electrical Pullbox	EA	12			
19	SP-126-4.7b	Demolish FAA Pullbox	EA	5			
20	SP-126-4.8	Demolish Airfield Sign and Pad	EA	9			
21	SP-126-4.11a	Demolish Elevated Taxiway Edge Light and Can. Salvage Existing Fixture.	EA	65			
22	SP-126-4.12a	Demolish In-pavement Taxiway Edge Light and Can. Salvage Existing Fixture.	EA	64			
PAGE SUBTOTAL IN FIGURES (ITEMS 12-22)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE E - BID ALTERNATE 2

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
23	SP-126-4.17	Demolish Abandoned Waterline, if Encountered	LF	400			
24	SP-126-4.16	Demolish Concrete Valley Gutter	LF	170			
25	P-152-4.1	Unclassified Excavation and Haul-off	CY	25,300			
26	P-152-4.2	Embankment in Place	CY	8,900			
27	P-152-4.3	Subgrade Preparation	SY	76,400			
28	P-155-8.1	Lime Treated Subgrade, 16-Inch Depth	SY	63,600			
29	SP-100-3.4	In-place Drying Techniques	SY	6,400			
30	SP-100-3.5	Subgrade Stabilization, Excavation Below Subgrade	CY	1,300			
31	SP-100-3.6	Multi-axial Geogrid	SY	2,000			
32	P-209-5.1	Crushed Aggregate Base Course, P-209	CY	21,100			
33	P-401-8.1	Asphalt Concrete Surface Course, P-401	TON	15,600			
PAGE SUBTOTAL IN FIGURES (ITEMS 23-33)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE E - BID ALTERNATE 2

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
34	P-621-5.1	Grooving	SY	200			
35	D-701-5.1	12-inch RCP, Class IV, outside Pavement Areas	LF	200			
36	D-701-5.2	12-inch RCP, Class IV, within Pavement Areas	LF	340			
37	D-705-5.1	Underdrain Pipe, 6-Inch, Perforated	LF	9,000			
38	D-705-5.2	Underdrain Pipe Cleanout	EA	37			
39	D-751-5.1	48" Stormdrain Manhole	EA	14			
40	D-751-5.2	Catch Basin/Drop Inlet	EA	2			
41	D-751-5.3	Adjust Catch Basin to Grade	EA	1			
42	D-751-5.4	Connect to Existing Manhole/Basin	EA	4			
43	D-754-5.1	Construct Concrete Valley Gutter and Apron	LF	120			
44	P-153-6.1	Controlled Low-Strength Material (CLSM) for Existing Utility Protection	CY	300			
PAGE SUBTOTAL IN FIGURES (ITEMS 34-44)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE E - BID ALTERNATE 2

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
45	L-108-5.1	No. 8 AWG 5 kV, L-824, Type C Cable, Installed in Duct Bank or Conduit	LF	20,800			
46	L-108-5.2a	No. 6 AWG Bare Counterpoise Wire, Installed Adjacent to / In the Duct Bank or Conduit	LF	13,400			
47	L-110-5.1	Concrete Encased Electrical Duct Bank, 1W - 2" Conduit	LF	6,600			
48	L-110-5.3	Concrete Encased Electrical Duct Bank, 5W - 2" Conduit	LF	100			
49	L-110-5.5	Non-encased Electrical Duct Bank, 1W - 2" Conduit	LF	6,600			
50	L-110-5.6	Non-encased Electrical Duct Bank, 2W - 2" Conduit	LF	490			
51	L-110-5.7	Non-encased Electrical Duct Bank, 3W - 2" Conduit	LF	160			
52	L-110-5.9	Concrete Encase Existing FAA Line Under Proposed Pavement	LF	400			
53	L-110-5.10	Concrete Encase Existing FAA Line Outside Pavement	LF	30			
54	L-110-5.11	Lower and Concrete Encase FAA Line	LF	70			
55	L-115-5.1a	Construct Electrical Pullbox: Aircraft Rated	EA	1			
PAGE SUBTOTAL IN FIGURES (ITEMS 45-55)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE E - BID ALTERNATE 2

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
56	L-115-5.1b	Construct FAA Pull Box	EA	5			
57	L-115-5.1c	Construct Junction Can: L-868 with Lid	EA	2			
58	L-125-5.1t	Construct New L-858(L) Airfield Guidance Sign (F1) and Concrete Pad	EA	1			
59	L-125-5.1u	Construct New L-858(L) Airfield Guidance Sign (F2) and Concrete Pad	EA	1			
60	L-125-5.1v	Construct New L-858(L) Airfield Guidance Sign (F3) and Concrete Pad	EA	1			
61	L-125-5.1w	Construct New L-858(L) Airfield Guidance Sign (F4) and Concrete Pad	EA	1			
62	L-125-5.1x	Construct New L-858(L) Airfield Guidance Sign (F5) and Concrete Pad	EA	1			
63	L-125-5.1y	Construct New L-858(L) Airfield Guidance Sign (F6) and Concrete Pad	EA	1			
64	L-125-5.1z	Construct New L-858(L) Airfield Guidance Sign (F7) and Concrete Pad	EA	1			
65	L-125-5.1aa	Construct New L-858(L) Airfield Guidance Sign (F8) and Concrete Pad	EA	1			
66	L-125-5.1bb	Construct New L-858(L) Airfield Guidance Sign (F9) and Concrete Pad	EA	1			
67	L-125-5.2	Install Salvaged Unlit Informational Sign on Existing Concrete Pad	EA	1			
PAGE SUBTOTAL IN FIGURES (ITEMS 56-67)						$	

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULE E - BID ALTERNATE 2

ITEM NO.	SPEC. REF	ITEM DESCRIPTION	UNIT	QTY	UNIT PRICE		TOTAL Price (Figures)
					Figures	in Words (dollars & cents)	
68	L-125-5.3	Install Salvaged Unlit Informational Sign on New Concrete Pad	EA	1			
69	L-125-5.9	Construct New L-861T(L) Medium Intensity Elevated Taxiway Edge Light and Base Can	EA	70			
70	L-125-5.10	Construct New L-852T(L) Medium Intensity In-Pavement Taxiway Edge Light and Base Can	EA	66			
71	L-125-5.12	Install ID Tag	EA	136			
72	L-125-5.14	Change Sign Legend	EA	8			
73	P-620-5.2a	Marking, 2 Coats with Beads (All Colors)	SF	22,100			
74	P-620-5.2c	Marking, Single Coat with No Beads (All Colors)	SF	57,400			
75	P-620-5.2d	Marking, Single Coat with Beads (All Colors)	SF	10,600			
76	T-901-5.1	Seeding	AC	9			
PAGE SUBTOTAL IN FIGURES (ITEMS 68-76)						$	
TOTAL BID SCHEDULE E IN FIGURES						$	
TOTAL BID SCHEDULE E IN WORDS:							

BID SCHEDULE (SCHEDULE OF WORK PRICES)
OXNARD AIRPORT - RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT REHABILITATION
SCHEDULES SUMMARY

Note: Transitions (Bid Schedules B and D) are only to be awarded in the event that the entire Project is not awarded. For purposes of total Project cost calculations, the aggregate sum of Schedule A, Schedule C, and Schedule E is considered a complete Award of the Base Bid, Bid Alternate 1, and Bid Alternate 2.

RUNWAY ONLY = SCHEDULE A + SCHEDULE B = _____(FIGURES)

RUNWAY AND TAXIWAY CONNECTORS = SCHEDULE A + SCHEDULE C + SCHEDULE D = _____(FIGURES)

TOTAL PROJECT = SCHEDULE A + SCHEDULE C + SCHEDULE E = _____(FIGURES)

Bidder's Certification: "I make the above Proposal (Bid) and certify or declare under penalty of perjury that the statements made under my signature in this Proposal (Bid) are true and correct"

_____

Signature / Title

Acknowledgment of Addenda (Proposer or Bidder must initial for each addenda received)

Addenda No.: ____ Initial: _____

Addenda No.: ____ Initial: _____

Addenda No.: ____ Initial: _____

Proposer or Bidder's Information

_____

Printed Name & Title

Type of Organization

__ Corp. __ Partnership __ Individual

Company Name: _____

Address: _____

City, State, Zip: _____

License No.: _____ Class: _____ Exp.: _____

State Tax ID No: _____

Federal Tax ID No: _____

DIR Registration No: _____

"Contractor's License No., Class & Expiration date are made under penalty of perjury."

BID PRICE ADJUSTMENTS

This Form is to be used only to modify the Total Price Bid for an item or group of items on the Proposal document (Bid Form) without the necessity of re-computing the line Totals, Unit Prices, or the Total Price Bid. It is particularly intended to allow adjustments for last minute material quotes or Subcontract Bids.

DO NOT CONDITION / QUALIFY your PROPOSAL (BID) or OFFER

ALTERNATIVES. DO NOT ADJUST STIPULATED PRICES.

To Agency - Make the following adjustments to the prices bid in this proposal:

BID ITEM NUMBERS (Indicate Schedule or Alternative Numbers as shown) (If more than one bid item, numbers are inclusive)	Adjust the Total Price Bid for Items indicated in the first column as shown below.	
	DECREASE	**INCREASE**

Note: 1. The adjustments will be made in accordance with Section 16 of the "Instructions to Bidders."

2. Do not condition the adjustments. See Section 7 of the "Instructions to Bidders."

Bidder's Name: _____

_____ Date: _____

Signature and Title

NON – COLLUSION AFFIDAVIT

I, the person whose signature is affixed to the last page of this Proposal (Bid), submit this Proposal (Bid) to the Board of Supervisors and hereby declare:

1. That the Proposer or Bidder has read this Proposal (Bid) and has abided by and agrees to the conditions herein and has carefully examined the project Plans and read the Specifications and does hereby propose to furnish all materials and do all the work required to complete the work in accordance with the Plans and Specifications for the Unit Prices or Lump Sum amounts named in the Schedule of Work and Prices.

2. That the Addenda indicated on the last page of this Proposal are acknowledged.

3. That the Proposer or Bidder, as Principal, acknowledges himself as being bound by the attached Bid Bond or other acceptable Bid Guarantee.

4. That the Proposal (Bid) is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the Proposal (Bid) is genuine and not collusive or sham; that the Proposer or Bidder has not directly or indirectly induced or solicited any other Proposer or Bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any Proposer or Bidder or anyone else to put in a sham Proposal (Bid), or that anyone shall refrain from bidding; that the Bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the Proposal (Bid) price of the Proposer or Bidder or any other Proposer or Bidder, or to fix any overhead, profit, or cost element of the Proposal (Bid) price, or of that of any other Proposer or Bidder, or to secure any advantage against the public body awarding the Contract of anyone interested in the proposed Contract; that all statements contained in the Proposal (Bid) are true; and, further, that the Proposer or Bidder has not, directly or indirectly, submitted a Proposal (Bid) price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham Proposal (Bid).

Bidder's Name: _____

_____ Date: _____

Signature and Title

ASSURANCE of COMPLIANCE
DISADVANTAGED BUSINESS ENTERPRISE
DBE UTILIZATION

(TITLE 49 CFR PART 23)

The undersigned Proposer or Bidder has satisfied the requirements of the Proposal (Bid) specification in the following manner (please check the appropriate space):

- The Proposer or Bidder is committed to a minimum of____**% DBE** utilization on this Contract. – OR -
- The Proposer or Bidder (if unable to meet the **DBE goal 5.00%**) is committed to a minimum of____**%** DBE utilization on this Contract and submits documenting good faith efforts.

The undersigned hereby further assures that the information included herein is true and correct, and that the DBE firm(s) listed herein have agreed to perform a commercially useful function in the work items noted for each firm. The undersigned further understands that no changes to this statement may be made without prior approval from the Civil Right Staff of the Federal Aviation Administration.

Name of Bidder's firm: _____

State Registration No.: _____

By: _____

Title: _____

LIST of DBE SUBCONTRACTORS AND DBE MATERIAL SUPPLIERS

	NAME	PHONE	BID ITEM	AMOUNT
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				

Attach additional pages as necessary.
(Submit Letter of Intent for each DBE subcontractor within 10 days of request.)

CERTIFICATION of AFFIRMATIVE ACTION PROGRAM

The Proposer or Bidder hereby certifies that they are in compliance with the Civil Rights Act of 1964, Executive Order No. 11246, Employment Practices Act, and any other applicable Federal and State laws and regulations relating to Equal Opportunity Employment.

Bidder's Name: _____

_____ Date: _____
Signature and Title

NOTE:

The Contractor to whom the Contract is awarded shall submit a statement each month certifying that he is in conformance with the Affirmative Action Program.

CERTIFICATION OF PROHIBITION of SEGREGATED FACILITIES

(a) The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Opportunity clause in this contract.

(b) "Segregated facilities," as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.

(c) The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Opportunity clause of this contract.

Bidder's Name: _____

_____ Date: _____

Signature and Title

BIDDER'S STATEMENT
PREVIOUS CONTRACTS SUBJECT to EEO CLAUSE

The Proposer or Bidder shall complete the following statement by checking the appropriate boxes.

The Proposer or Bidder **( ) has / ( ) has not** participated in a previous Contract subject to the equal opportunity clause prescribed by Executive Order 10925, or Executive Order 11114, or Executive Order 11246.

The Proposer or Bidder **( ) has / ( ) has not** submitted all compliance reports in connection with any such Contract due under the applicable filing requirements; and that representations indicating submission of required compliance reports signed by proposed Subcontractors will be obtained prior to award of subcontracts.

If the Proposer or Bidder has participated in a previous Contract subject to the equal opportunity clause and has not submitted compliance reports due under applicable filing requirements, the Proposer or Bidder shall submit a compliance report on Standard Form 100, "Employee Information Report EO-1", prior to the award of Contract.

Bidder's Name: _____

_____ Date: _____
Signature and Title

SUBCONTRACTOR'S STATEMENT
PREVIOUS CONTRACTS SUBJECT to EEO CLAUSE

The CONTRACTOR shall have each SUBCONTRACTOR complete the following form and submit it to the AGENCY prior to issuance of the Notice to Proceed.

The Subcontractor shall complete the following statement by checking the appropriate boxes.

The Subcontractor **( ) has / ( ) has not** participated in a previous Contract subject to the equal opportunity clause prescribed by Executive Order 10925, or Executive Order 11114, or Executive Order 11246.

The Subcontractor **( ) has / ( ) has not** submitted all compliance reports in connection with any such Contract due under the applicable filing requirements; and that representations indicating submission of required compliance reports signed by proposed Subcontractors will be obtained prior to award of subcontracts.

If the Subcontractor has participated in a previous Contract subject to the equal opportunity clause and has not submitted compliance reports due under applicable filing requirements, the Proposer or Bidder shall submit a compliance report on Standard Form 100, "Employee Information Report EO-1", prior to the award of Contract.

Subcontractor's Name: _____

_____ Date: _____
Signature and Title

NOTE: THIS DOCUMENT IS REQUIRED PRIOR TO THE ISSUANCE OF AN NTP. IT IS NOT REQUIRED TO BE SUBMITTED WITH THE BID.

SUSPENSION AND DEBARMENT REQUIREMENTS
FOR ALL CONTRACTS OVER $25,000
49 CFR PART 29

By submitting a bid/proposal under this solicitation, the bidder or offeror certifies that at the time the bidder or offeror submits its proposal that neither it nor its principals are presently debarred or suspended by any Federal department or agency from participation in this transaction.

The successful bidder, by administering each lower tier subcontract that exceeds $25,000 as a "covered transaction", must verify each lower tier participant of a "covered transaction" under the project is not presently debarred or otherwise disqualified from participation in this federally assisted project. The successful bidder will accomplish this by:

1. Checking the System for Award Management at website: http://www.sam.gov
2. Collecting a certification statement similar to the Certificate Regarding Debarment and Suspension (Bidder or Offeror), above.
3. Inserting a clause or condition in the covered transaction with the lower tier contract

If the FAA later determines that a lower tier participant failed to tell a higher tier that it was excluded or disqualified at the time it entered the covered transaction, the FAA may pursue any available remedy, including suspension and debarment.

_____

Signature (Name of Proposer or Bidder)

_____ _____

Date (Name and Title of Signing Official)

Business Address

_____

_____

_____

CERTIFICATION on NON-LOBBYING ACTIVITIES

The undersigned certifies, to the best of their knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the Undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal Contract, the making of any Federal Grant or Federal Loan, and the extension, continuation, renewal, amendment, or modification of any Federal Contract, Grant or Loan.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal Contract, Grant or Loan, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the Award documents for all subawards at all tiers (including Contracts, Subcontracts, and Subgrants under Grants and Loans) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Bidder's Name: _____

_____ Date: _____

Signature & Title

PUBLIC CONTRACT CODE SECTION 10285.1 STATEMENT

In accordance with Public Contract Code Section 10285.1 (Chapter 376, Stats.1985), the Proposer or Bidder hereby declares under penalty of perjury under the laws of the State of California that the

Proposer or Bidder has_____; has not_____been convicted within the preceding three years of any offenses referred to in that Section including any charge of fraud, bribery, collusion, conspiracy, or any other act in violation of any State or Federal Antitrust Law in connection with the bidding upon, award of, or performance of, any public works contract, as defined in Public Contract Code Section 1101, with any public entity, as defined in Public Contract Code Section 1100, including the Regents of the University of California or the Trustees of the California State University. The term “Proposer” or "Bidder" is understood to include any partner, member, officer, director, responsible managing officer, or responsible managing employee thereof, as referred to in Section 10285.1.

Note: The Proposer or Bidder must place a check mark after "has" or "has not" in one of the blank spaces provided. The above Statement is part of the Proposal (Bid). Signing this Proposal (Bid) on the signature portion thereof shall also constitute signature of this Statement.

Proposers or Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

PUBLIC CONTRACT CODE SECTION 10162 QUESTIONNAIRE

In accordance with Public Contract Code Section 10162, the Proposer or Bidder shall complete, under penalty of perjury, the following questionnaire:

Has the Proposer or Bidder, any officer of the Proposer or Bidder, or any employee of the Proposer or Bidder who has a proprietary interest in the Proposer or Bidder, ever been disqualified, removed, or otherwise prevented from Proposing (Bidding) on, or completing a federal, state, or local government project because of a violation of law or a safety regulation?

Yes ____ : No ____ If the answer is yes, explain the circumstances in the following space (Attach additional sheets as necessary)

PUBLIC CONTRACT SECTION 10232 STATEMENT

In accordance with Public Contract Code Section 10232, the Contractor, hereby states under penalty of perjury, that no more than one final un-appealable finding of contempt of court by a Federal Court has been issued against the Contractor within the immediately preceding two-year period because of the Contractor's failure to comply with an order of a Federal Court which orders the Contractor to comply with an order of the National Labor Relations Board.

Note: The above Statement and Questionnaire are part of the Proposal (Bid). Signing this Proposal (Bid) on the signature portion thereof shall also constitute signature of this Statement and Questionnaire.

Proposers or Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

CERTIFICATION REGARDING FOREIGN TRADE RESTRICTIONS

The Contractor or Subcontractor, by submission of an offer and/or execution of a contract, certifies that it:

(a) is not owned or controlled by one or more citizens or nationals of a foreign country included in the list of countries that discriminate against U.S. firms published by the Office of the United States, Trade Representative (USTR);
(b) has not knowingly entered into any Contract or Subcontract for this Project with a contractor that is a citizen or national of a foreign country on said list, or is owned or controlled directly or indirectly by one or more citizens or nationals of a foreign country on said list;
(c) has not procured any product nor subcontracted for the supply of any product for use on the Project that is produced in a foreign country on said list.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no Contract shall be awarded to a Contractor or Subcontractor who is unable to certify to the above. If the Contractor knowingly procures or subcontracts for the supply of any product or service of a foreign country on said list for use on the Project, the Federal aviation administration may direct, through the Sponsor, cancellation of the Contract at no cost to the Government.

Further, the Contractor agrees that, if awarded a Contract resulting from this solicitation, it will incorporate this provision for certification without modification in each Contract and in all lower tier Subcontracts. The Contractor may rely upon the certification of a prospective Subcontractor unless it has knowledge the certification is erroneous.

The Contractor shall provide immediate written notice to the Sponsor if the Contractor learns that its certification or that of a Subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The Subcontractor agrees to provide immediate written notice to the Contractor, if at any time it learns that its certification was erroneous by reason of changed circumstances.

This certification is a material representation of fact upon which reliance was placed when making the award. If it is later determined that the Contractor or Subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration may direct, through the Sponsor, cancellation of the Contract or Subcontract for default at no cost to the Government.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a Contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

Bidder's Name: _____

_____ Date: _____

Signature and Title

CERTIFICATE OF BUY AMERICAN COMPLIANCE FOR MANUFACTURED PRODUCTS

(Type 2 - Non-building construction projects, equipment acquisition projects)

PROJECT NAME:	**Runway 7-25, Taxiway Connectors, and Parallel Taxiway Pavement Reconstruction**
AIRPORT NAME:	**Oxnard Airport**
AIP NUMBER:	**03-06-0179-38-2021**

This solicitation and any resulting contract(s) are subject to the Buy America requirements of 49 Section 50101. The Proposer or Bidder certifies it and all associated Subcontractors will comply with the Buy American preferences established under Title 49 U.S.C. Section 50101 as follows:

U.S.C. Section 50101 - Buying goods produced in the United States

The Contractor agrees to comply with 49 USC § 50101, which provides that Federal funds may not be obligated unless all steel and manufactured goods used in AIP-funded projects are produced in the United States, unless the FAA has issued a waiver for the product; the product is listed as an Excepted Article, Material Or Supply in Federal Acquisition Regulation subpart 25.108; or is included in the FAA Nationwide Buy American Waivers Issued list.

A Proposer or Bidder must submit the appropriate Buy America certification (below) with all Proposals (Bids) on AIP funded projects. Proposals (Bids) that are not accompanied by a completed Buy America certification must be rejected as Non-Responsive.

Type of Certification is based on Type of Project:

There are two types of Buy American certifications.

1. For projects for a facility, the Certificate of Compliance Based on Total Facility (Terminal or Building Project) must be submitted.
2. For all other projects, the Certificate of Compliance Based on Equipment and Materials Used on the Project (Non-building construction projects such as runway or roadway construction; or equipment acquisition projects) must be submitted.

CERTIFICATE OF BUY AMERICAN COMPLIANCE FOR MANUFACTURED PRODUCTS (Cont.)

As a matter of Bid Responsiveness, the Proposer or Bidder must complete, sign, date, and submit this certification statement with their Proposal (Bid). The Proposer or Bidder must indicate how they intend to comply with 49 USC § 50101 by selecting one on the following certification statements. These statements are mutually exclusive. Proposer or Bidder must select one or the other (not both) by inserting a checkmark (✓) or the letter "X".

❑ Proposer or Bidder hereby certifies that it will comply with 49 USC § 50101 by:

a) Only installing steel and manufactured products produced in the United States, or;
b) Installing manufactured products for which the FAA has issued a waiver as indicated by inclusion on the current FAA Nationwide Buy American Waivers Issued listing, or;
c) Installing products listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation Subpart 25.108.

By selecting this certification statement, the Proposer or Bidder agrees:

1. To provide to the Agency evidence that documents the source and origin of the steel and manufactured product.
2. To faithfully comply with providing US domestic product.
3. To furnish US domestic product for any waiver request that the FAA rejects.
4. To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

❑ The Proposer or Bidder hereby certifies it cannot comply with the 100% Buy American Preferences of 49 USC § 50101(a) but may qualify for either a Type 3 or Type 4 waiver under 49 USC § 50101(b). By selecting this certification statement, the apparent Proposer or Bidder with the apparent low bid agrees:

1. To the submit to the Agency within 15 calendar days of the Bid Opening, a formal waiver request and required documentation that support the type of waiver being requested.
2. That failure to submit the required documentation within the specified timeframe is cause for a non-responsive determination may result in rejection of the Proposal (Bid).
3. To faithfully comply with providing US domestic products at or above the approved US domestic content percentage as approved by the FAA.
4. To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

CERTIFICATE OF BUY AMERICAN COMPLIANCE FOR MANUFACTURED PRODUCTS (Cont.)

Required Documentation

Type 3 Waiver - The cost of the item components and subcomponents produced in the United States is more that 60% of the cost of all components and subcomponents of the "item". The required documentation for a type 3 waiver is:

a) Listing of all product components and subcomponents that are not comprised of 100% US domestic content (Excludes products listed on the FAA Nationwide Buy American Waivers Issued listing and products excluded by Federal Acquisition Regulation Subpart 25.108; products of unknown origin must be considered as non-domestic products in their entirety)
b) Cost of non-domestic components and subcomponents, excluding labor costs associated with final assembly at place of manufacture.
c) Percentage of non-domestic component and subcomponent cost as compared to total "item" component and subcomponent costs, excluding labor costs associated with final assembly at place of manufacture.

Type 4 Waiver – Total cost of project using US domestic source product exceeds the total project cost using non-domestic product by 25%. The required documentation for a type 4 of waiver is:

a) Detailed cost information for total project using US domestic product
b) Detailed cost information for total project using non-domestic product

False Statements: Per 49 USC § 47126, this certification concerns a matter within the jurisdiction of the Federal Aviation Administration and the making of a false, fictitious or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code.

_____ Date: _____
Signature

_____ _____
Company Name Title

LIST OF SUBCONTRACTORS AND OFF-JOB FABRICATORS

PURSUANT TO THE PROVISIONS SET FORTH IN TITLE I, DIVISION 5, CHAPTER 2 (Sections 4100-4113, inclusive) of the Government Code of the State of California -- it is required that the Contractor set forth in his Proposal (Bid) the name and principal business address of each Subcontractor who will perform work or labor or render service to the Contractor on or about the construction.

Vendors or suppliers of materials, only, are not required to be listed.

If a Contractor fails to specify a Subcontractor for any portion of the work to be performed under the Contract, on or about the construction of the project, in excess of 1/2 of 1% of the Contractor's total Bid, he shall be deemed to have agreed to perform such portion himself, using his own resources and employed personnel and he shall not be permitted to sub-contract that portion of the work, except under the conditions set forth in Section 4107 of the Government Code of the State of California. Subcontractors shall not sublet their work as a whole.

Should the Contractor violate any of the provisions of said Chapter, his so doing will be deemed a violation of his Contract and the awarding authority shall have the right to terminate the Contractor's control over the work. Upon any such violation, the Contractor may be subject to such penalties as are prescribed by Law.

Name and Address of Subcontractor	License No.	DIR License No.	Description of Work & Reference to Bid Items	Portion of Work (%)

Bidder's Name: _____

_____ Date: _____

CERTIFICATION OF OFFERER/BIDDER REGARDING TAX DELINQUENCY AND FELONY CONVICTIONS

The applicant must complete the following two certification statements. The applicant must indicate its current status as it relates to tax delinquency and felony conviction by inserting a checkmark (✓) in the space following the applicable response. The applicant agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification in all lower tier subcontracts.

Certifications

1) The applicant represents that it is ( ) is not ( ) a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

2) The applicant represents that it is ( ) is not ( ) is not a corporation that was convicted of a criminal violation under any Federal law within the preceding 24 months.

Note

If an applicant responds in the affirmative to either of the above representations, the applicant is ineligible to receive an award unless the sponsor has received notification from the agency suspension and debarment official (SDO) that the SDO has considered suspension or debarment and determined that further action is not required to protect the Government's interests. The applicant therefore must provide information to the owner about its tax liability or conviction to the Owner, who will then notify the FAA Airports District Office, which will then notify the agency's SDO to facilitate completion of the required considerations before award decisions are made.

Term Definitions

Felony conviction: Felony conviction means a conviction within the preceding twenty-four (24) months of a felony criminal violation under any Federal law and includes conviction of an offense defined in a section of the U.S. code that specifically classifies the offense as a felony and conviction of an offense that is classified as a felony under 18 U.S.C. § 3559.

Tax Delinquency: A tax delinquency is any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

Date	Signature
Company Name	Title

STATE OF CALIFORNIA
DRUG-FREE WORKPLACE CERTIFICATION
STD. 21 (REV 12/93)

I, the official named below, herby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

CONTRACTOR/BIDDER FIRM NAME	FEDERAL ID NUMBER
(Authorized Signature)	DATE EXECUTED
PRINTED NAME AND TITLE OF PERSON SIGNING	TELEPHONE NUMBER (Include Area Code)
TITLE	
CONTRACTOR/BIDDER FIRM'S MAILING ADDRESS	

The contractor or grant recipient named above hereby certifies with Government Code Section 8355 in matters relating to providing a drug-free workplace. The above named contractor or grant recipient will:

3) Publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession, or use of controlled substance is prohibited and specifying actions to be taken against employees for violations, as required by Government Code Section 8355(a).

4) Establish a Drug-Free Awareness Program as required by Government Code 8355(b), to inform employees about all of the following:

   (a) The Dangers of drug abuse in the workplace,
   (b) The person's or organization's policy in maintaining a drug-free workplace,
   (c) Any available counseling, rehabilitation and employee assistance programs, and
   (d) Penalties that may be imposed upon employees for drug abuse violations.

5) Provide as required by Government Code 8355(c), that everyone who works on the proposed contract or grant:

   (a) Will receive a copy of the company's drug-free policy statement, and
   (b) Will agree to abide by the terms of the company's statement as a condition of employment on the contract or grant.

6) At the election of the contractor or grantee, from and after the "Date Executed" and until _____(NOT TO EXCEED 36 MONTHS), the state will regard this certificate as valid for all contracts or grants entered into between the contractor or grantee and this state agency without requiring the contractor or grantee to provide a new individual certificate for each contract or grant. If the contractor or grantee elects to fill in the blank date, then the terms of this certificate shall have the same force, meaning, effect and enforceability as if a certificate were separately, specifically, and individually provided for each contract or grant between the contractor or grantee and this state agency.

ADA Notice For individuals with sensory disabilities, this document is available in alternate formats. For information call (916) 654-6410 or TDD (916) 654-3880 or write Records and Forms Management, 1120 N Street, MS-89, Sacramento, CA 95814.

BID BOND

Spec. No. DOA 20-02

Enter Name & Address of Bonding Company }

KNOW ALL MEN BY THESE PRESENTS: That we

_____, Principal, and

_____,

Surety, are held and firmly bound unto **COUNTY OF VENTURA**, Oblige, in the sum of **Five Percent (5%)** of the total amount of the Proposal (Bid) for the payment of which we bind ourselves, our legal representatives, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has submitted or is about to submit a Proposal (Bid) to Oblige on a Contract for:

Oxnard Airport – Runway 7-25, Taxiway Connectors, and Parallel Taxiway Pavement Reconstruction

FAA AIP No.: **3-06-0339-0179-38-2020**
Spec. No.: **DOA 20-02 ;** Proj. No.: **OXR-146**

NOW, THEREFORE, if that Contract be awarded to Principal and Principal shall, within such time as may be specified, enter into the Contract in the prescribed form in writing and give such bond or bonds as may be specified in the Proposal document (Bid Form) with surety acceptable to Oblige then this obligation shall be null and void; otherwise to remain in full force and effect.

In the event suit is brought upon this bond by the Oblige and judgment is recovered, the Surety shall pay all costs incurred by the Oblige in the suit, including reasonable attorney's fee to be fixed by the court.

Signed, sealed and dated:

_____
(Principal)

by_____(Seal)

_____
(Surety)

by_____
(Attorney-in-Fact)

STATEMENT OF BIDDER'S QUALIFICATIONS

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information he desires.

1. Name of Bidder and office where project will be administered:

2. Provide evidence of financial responsibility consisting of a confidential statement or report of Contractor's financial resources and liabilities as of the last calendar year or last fiscal year. Such statement or report shall be certified by a public accountant. Unless otherwise specified, a bidder may submit evidence that he or she is prequalified with the State Highway Division and is on the current "bidder's list" of the state in which the proposed work is located. Such evidence of State Highway Division prequalification may be submitted as evidence of financial responsibility in lieu of the certified statements or reports specified above.

3. List two or more construction projects similar in size (at least $10 million total construction cost) and scope to this project that your company has completed within the past 3 years. Provide the following:

   a. Project Name: _____
   b. Owner Name: _____
   c. Owner Contact: _____
   d. Beginning Contract Amount: _____
   e. Total Cost of Change Orders: _____
   f. Project Duration: _____
   g. Total Time Extensions: _____
   h. Project Superintendent: _____

   a. Project Name: _____
   b. Owner Name: _____
   c. Owner Contact: _____
   d. Beginning Contract Amount: _____
   e. Total Cost of Change Orders: _____
   f. Project Duration: _____
   g. Total Time Extensions: _____
   h. Project Superintendent: _____

a. Project Name: _____
b. Owner Name: _____
c. Owner Contact: _____
d. Beginning Contract Amount: _____
e. Total Cost of Change Orders: _____
f. Project Duration: _____
g. Total Time Extensions: _____
h. Project Superintendent: _____

Note: All contact information shall be verified by the Contractor to be current and correct. This Information shall include: the Owner's name, address, phone number, the Owner's representative, who has working knowledge of the project, their name and phone number.

4. List any projects involving your company that have involved litigation, threatened litigation, or negotiated settlements due to quality of work, contract time or other noncompliance with plans and specifications.

5. Provide on a separate piece of paper the background and experience of the principal members of your organization, including as a minimum the following staff to be assigned to the Project: Full-time project manager, full-time superintendent(s), full-time quality control manager, CECSL, etc., including status of availability and percent availability of staff as of June 15, 2020.

6. Provide list of equipment owned by the Contractor planned to be dedicated to this project as of June 15, 2020. Leased equipment shall be identified separately from owned equipment. Production calculations of the proposed critical equipment package shall be provided. This shall demonstrate how the proposed equipment package can meet project timelines to include revisions to production factors for potential weather and above optimum in-situ soils.

7. Provide project specific schedule of major activities (erosion control, grading, drainage, aggregate placement, building construction, utilities, etc.) for the duration of the project for review. Also, include proposed working hours and assigned staff assignments should multiple shifts be proposed. Schedule will be evaluated for thoroughness, correlation to production rates and slack identified to account for working near other contractors, weather, maintenance, equipment breakdowns, quality control adjustments, etc.

8. Equipment: Please list below the major pieces of equipment (owned and rented) you will commit specifically to this project. Please provide specific details. Use additional sheets if necessary.

# of Units	Description	Rented or Owned	Size/Capacity

9. Type of Business Entity: _____
   NOTE: If bidder is **partnership** or **joint venture**, give full names of all partners or joint ventures. Bid must be signed by all Joint Ventures. If bidder is a **limited liability company**, bid must be signed by an authorized manager (may be signed by member-manager if LLC is organized to allow management by members).

10. Address of Contractor: _____

    _____

    _____

11. Telephone: _____ Fax: _____

    E-mail: _____

12. Established where and when:

    _____

13. Contractor's Banking Information: _____

    _____

    _____

14. Principal Officers of Contractor (managers and members if LLC):

    Name: _____ Name: _____

    Title: _____ Title: _____

    Name: _____ Name: _____

    Title: _____ Title: _____

    Name: _____ Name: _____

    Title: _____ Title: _____

15. Bidder's/Contractor's state of incorporation (state of organization if an LLC or Partnership):

    _____

16. Bidder's Surety: _____

17. Surety's State of Incorporation: _____

18. Name and Address of person to receive payment _____

_____

_____

19. If the Bidder/Contractor is a Joint Venture, it shall attach a certified copy of the Joint Venture Agreement. The Joint Venture Agreement will not be included as part of the Contract Documents.

20. The Bidder/Contractor shall identify all applicable labor agreements (if any) to be used in the performance of the work:

_____

_____

_____

_____

The undersigned, as a duly authorized representative of the Contractor, certifies that the information provided in this Prequalification Form is accurate as reported.

The undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the Owner in verification of the recitals comprising this Statement.

Dated at this day of _____.

(Name of Bidder) _____

By: _____

Title: _____

State of)
) ss.
County of)

_____ being duly sworn deposes and says that he is _____

of

_____ (Name of Organization) and that the answers to the foregoing questions and all statements therein contained are true and correct.
Subscribed and sworn to before me this day of _____.

(Notary Public) _____

State of _____

My Commission Expires _____

DISADVANTAGED BUSINESS ENTERPRISE

LETTER OF INTENT

Name of bidder/offeror's firm: _____

Address: _____

City: _____ State: _____ Zip: _____

Name of DBE firm: _____

Address: _____

City: _____ State: _____ Zip: _____

Telephone: _____

Description of work to be performed by DBE firm:

_____

_____

_____

_____

The bidder/offeror is committed to utilizing the above-named DBE firm for the work described above. The estimated dollar value of this work is $_____.

AFFIRMATION

The above-named DBE firm affirms that it will perform the portion of the contract for the estimated dollar value as stated above.

By _____
(Signature) (Title)

If the bidder/offeror does not receive award of the prime contract, any and all representations in this Letter of Intent and Affirmation shall be null and void.

(Submit this page for each DBE subcontractor or material supplier within 10 days of request)

COUNTY OF VENTURA STANDARD SPECIFICATIONS

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COUNTY of VENTURA

Department of Airports

STANDARD SPECIFICATIONS

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COUNTY OF VENTURA

PUBLIC WORKS AGENCY

STANDARD SPECIFICATIONS

PART 1 - GENERAL PROVISIONS

SECTION 0 - SSPWC ADOPTION AND MODIFICATIONS

0-1 STANDARD SPECIFICATIONS

Except as hereinafter provided or as modified by the Special Provisions, the provisions of Parts 2 through 5 of the 2015 edition of the Standard Specifications for Public Works Construction (referred to as SSPWC), published by BNi Building News, Los Angeles, are part of these Standard Specifications.

0-2 DELETIONS

The following portions of SSPWC are hereby deleted: Part 1 and Sections 200-1.6.2, and 301-1.4.

0-3 NUMBERING OF SECTIONS

The numbering in these modifications is compatible with the numbering in SSPWC. References to whole sections of SSPWC and these modifications are preceded by the word "Section", references to parts of sections show numbers only, such as "211-5", except at the beginning of a sentence, the word "Section" precedes the number. Standard Special Provisions, if included, are numbered as Sections 901 through 999. The Special Provisions are numbered starting with Section 1000 or higher.

Cross-references contained in SSPWC to sections deleted by 0-2 hereof shall be references to the sections of like number contained herein.

0-4 ADDITIONS

The sections that follow, either, replace sections of like number in SSPWC which were deleted in 0-2 above, modify sections of SSPWC, or add material not in SSPWC.

SECTION 1 - TERMS, DEFINITIONS, ABBREVIATIONS, UNITS OF MEASURE AND SYMBOLS

1-1 GENERAL Unless otherwise stated, the words directed, required, permitted, ordered, instructed, designated, considered necessary, prescribed, approved, acceptable, satisfactory, or words of like meaning, refer to actions, expressions, and prerogatives of the Engineer.

1-2 TERMS AND DEFINITIONS

Acceptance--The formal written acceptance by the Agency of the Work which has been completed in all respects in accordance with the Plans and Specifications and any Modifications thereof.

Addendum--Written or graphic instrument issued prior to the opening of Bids which clarifies, corrects or changes the bidding or Contract Documents. The term "Addendum" shall include bulletins and all other types of written notices issued to potential bidders prior to opening of Bids.

Agency--The legal entity for which the Work is being performed. Agreement--See Contract.

Base--A layer of specified material of planned thickness placed immediately below the pavement or surfacing.

Bid--The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work.

Bidder--Any individual, firm, partnership, corporation, or combination thereof, submitting a Bid for the Work, acting directly or through a duly authorized representative.

Board--The officer or body constituting the awarding authority of the Agency.

Bond--Bid, performance and payment bond or other instrument of security.

Cash Contract--A contract financed by means other than special assessments.

Certificate of Compliance—A written document signed and submitted by a supplier or manufacturer that certifies that the material or assembled material supplied to the Work site conforms to the requirements of the Contract Documents.

Change Order--A written order to the Contractor signed by the Agency directing an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract time issued after the effective date of the Contract. A Change Order may or may not also be signed by the Contractor.

Code--The terms Government Code, Labor Code, etc. refer to codes of the State of California.

Consultant--A professional engineer, architect, landscape architect or other professional who designed the project or performed other services for the Agency on the project.

Contract--The written agreement between the Agency and the Contractor covering the Work.

Contract Documents--The Contract, Addenda, notice inviting bids, instruction to bidders; Bid (including documentation accompanying the Bid and any post-bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Contract, the Bonds, permits from jurisdictional regulatory agencies, Special Provisions, Plans, Standard Plans, Standard Specifications, Reference Specifications, Change Orders and Supplemental Agreements.

Contractor--The individual, partnership, corporation, joint venture, or other legal entity having a Contract with the Agency to perform the Work. In the case of work being done under permit issued by the Agency, the Permittee shall be construed to be the Contractor. The term "prime contractor" shall mean Contractor.

Contract Price--The total amount of money for which the Contract is awarded.

Contract Unit Price--The amount shown in the Bid for a single unit of an item of work.

County Sealer--The Sealer of Weights and Measures of the county in which the Contract is let.

Days--Days shall mean consecutive calendar days unless otherwise specified.

Daily Extra Work Reports--Reports on Agency furnished forms as required by 3-3.

Disputed Work--Work in which Agency and Contractor are in disagreement.

Due Notice--A written notification, given in due time, of a proposed action where such notification is required by the Contract to be given a specified interval of time (usually 48 hours or two Working Days) prior to the commencement of the contemplated action. Notification may be from Engineer to Contractor or from Contractor to Engineer.

Electrolier--Street light assembly complete, including foundation, standard, luminaire arm, luminaire, etc.

1-2 DEFINITIONS (Continued)

Engineer-- The Director of Public Works Agency acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties delegated to them.

Field Directive--A written communication from the Engineer to the Contractor that does not make any Modification to the Contract Documents. It is used only to answer Contractor's questions and to provide decisions as specified in the Contract Documents.

Geotextile--Synthetic fiber used in civil engineering applications, serving the primary function of separation and filtration.

House Connection Sewer--A sewer, within a public street or right of way, proposed to connect any parcel, lot, or part of a lot with a main line sewer.

House Sewer--A sewer, wholly within private property, proposed to connect any building to a house connection sewer.

Luminaire--The lamp housing including the optical and socket assemblies (and ballast if so specified).

Major Bid Item--A single Contract item constituting 10% or more of the original Contract Price.

Mast Arm- The structural member or bracket, which, when mounted on a Standard, supports the luminaire.

Modification--Includes Change Orders and Supplemental Agreements. A Modification may only be issued after the effective date of the Contract.

Notice of Award--The written notice by the Agency to the successful Bidder stating that upon compliance by it with the required conditions, the Agency will execute the Contract.

Notice to Proceed--A written notice given by the Agency to the Contractor fixing the date on which the Contract time will start.

Owner--Same meaning as Agency.

Person--Any individual, firm, association, partnership, corporation, trust, joint venture, or other legal entity.

Plans--The drawings, profiles, cross sections, Standard Plans, working drawings, shop drawings, and supplemental drawings, or reproductions thereof, approved by the Engineer, which show the location, character, dimensions, or details of the Work.

Private Contract--Work subject to Agency inspection, control, and approval, involving private funds, not administered by the Agency.

Prompt--The briefest interval of time required for a considered reply, including time required for approval by a governing body.

Proposal--See Bid.

Reference Specifications--Those bulletins, standards, rules, methods of analysis or testing, codes, and specifications of other agencies, engineering societies, or industrial associations referred to in the Contract Documents. These refer to the latest edition, including amendments in effect and published at the time of advertising the project or issuing the permit, unless specifically referred to by edition, volume, or date.

Roadway--The portion of a street reserved for vehicular use.

Service Connection-All or any portion of the conduit cable or duct including meter, between a utility distribution line and an individual consumer

Service Lateral Connection-The interface of the House Connection Sewer with the host pipe. Sewer--Any conduit intended for the reception and transfer of sewage and fluid industrial waste.

Shop Drawings—Drawings showing details of manufactured or assembled products proposed to be incorporated in the Work.

Special Provisions--Any provisions which supplement or modify the Standard Specifications.

Specifications--Standard Specifications, Reference Specifications, Standard Special Provisions, Special Provisions, and specifications in Change Orders or Supplemental Agreements between the Contractor and the Board.

Standard—The shaft or pole used to support street lighting luminaire, traffic signal heads, mast arms, etc.

Standard Plans--Details of standard structures, devices, or instructions referred to on the Plans or in the Specifications by title or number.

Standard Special Provisions-- Special Provisions prepared in standardized form numbered in the series 401 through 499.

1-2 DEFINITIONS (Continued)

Standard Specifications--Parts 1 through 6 of this document. See Section 0. References to whole sections will be preceded by the word "Section", references to parts of sections will show numbers only, such as "3-2", except at the beginning of a sentence, the word "Section" precedes the number.

State--The State of California.

State Standard Plans--Standard Plans prepared by State of California, Business and Transportation Agency, Department of Transportation.

Stipulated Unit Price--Unit prices established by Agency in the Contract Documents.

Storm Drain--Any conduit and appurtenances intended for the reception and transfer of storm water.

Street--Any road, highway, parkway, freeway, alley, walk or way.

Subbase--A layer of specified material of planned thickness between a base and the subgrade.

Subcontractor--An individual, firm or corporation having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work.

Subgrade--For roadways, that portion of the roadbed on which pavement, surfacing, base, subbase, or a layer of other material is placed. For structures, the soil prepared to support a structure.

Supervision--Supervision, where used to indicate supervision by the Engineer, shall mean the performance of obligations, and the exercise of rights, specifically imposed upon and granted to the Agency in becoming a party to the Contract. Except as specifically stated herein, supervision by the Agency shall not mean active and direct superintendence of details of the Work.

Supplemental Agreement--A written amendment of the Contract Documents signed by both parties.

Surety--See 2-4.

Utility--Tracks, overhead or underground wires, pipelines, conduits, ducts, or structures, sewers or storm drains owned, operated or maintained in or across a public right of way or private easement.

Work--That which is proposed to be constructed or done under the Contract or permit, including the furnishing of all labor, materials, equipment, and services.

Working Day--See 6-7.2 and 6.7.2.1.

Working Drawings—Drawings showing details not shown on the Plans which are required to designed by the Contractor

1-3 ABBREVIATIONS

1-3.1 General. The abbreviations herein, together with others in general use, are applicable to these Standard Specifications and to all other Contract Documents.

All abbreviations and symbols used on Plans for structural steel construction shall conform to those given by the "Manual of Steel Construction" published by the American Institute of Steel Construction, Inc.

1-3.2 Common Usage

Abbreviation	Word or Words	Abbreviation	Word or Words
Aban	Abandon	l	Liters
Aband	Abandoned	Lab	Laboratory
ABS	Acrylonitrile-butadiene-styrene	Lat	Lateral
AC	Asphalt Concrete	LD	Local depression
ACP	Asbestos cement pipe	LED	Light Emitting Diode
ADA	Americans with Disabilities Act of 1990 (Public Law 101- 336, 104 Sat. 1990,42 USC 12101-12213 (as amended))	LH	Lamp hole
Alt	Alternate	LL	Live load
AmerStd	American Standard	LOL	Layout line
APC	Air Placed Concrete	Long	Longitudinal
ARAM	Asphalt Rubber Aggregate Membrane	LP	Lamp post
ARHM	Asphalt Rubber Hot Mix	LPS	Low pressure sodium (Light)
AWG	American Wire Gage (non-ferrous wire)	LS	Lump sum
B/W	Back of wall	LTS	Lime treated soil
BC	Beginning of curve	m	Meters
BCR	Beginning of curb return	Maint	Maintenance
Bdry	Boundary	Max	Maximum
BF	Bottom of footing	MC	Medium curing
BM	Bench mark	MCR	Middle of curb return
BMPs	Best Management Practices	Meas	Measure
BVC	Beginning of vertical curve	MH	Manhole, maintenance hole
C&G	Curb & Gutter	Mil Spec	Military specification
C&G	Curb and gutter	Min	Minimum
CAB	Crushed aggregate base	Misc	Miscellaneous

Abbreviation	Word or Words
CALOSHA	California Occupational Safety and Health Administration
CALTRANS	California Department of Transportation
CAP	Corrugated aluminum pipe
CB	Catch Basin
Cb	Curb
CBP	Catch Basin Connection Pipe
CBR	California Bearing Ratio
C-C	Center to center
CCFRPM	Centrifugally Cast Fiberglass Reinforced Plastic Mortar
CCR	California Code of Regulations
CCTV	Closed Circuit TV
CF	Cubic foot
CF	Curb face
CFR	Code of Federal Regulations
CFS	Cubic feet per second
CHDPE	Corrugated High Density Polyethylene
CIP	Cast iron pipe
CIPP	Cast-in-place pipe
CIPPC	Cast-in-place Concrete Pipe
CL	Clearance, center line
CLF	Chain link fence
CLSM	Controlled Low Strength Material
CMB	Crushed miscellaneous base
CMC	Cement mortar-coated
CML	Cement mortar-lined
cms	Cubic meters per second
CO	Cleanout (Sewer)
Col	Column
Conc	Concrete
Conn	Connection
Const	Construct, Construction
Coord	Coordinate
CQS	Cationic Quick-Setting
CRM	Crumb Rubber Modifier
CRS	Cationic Rapid-Setting
CSEP	Confined Space Entry Plan
CSP	Corrugated steel pipe
CSPA	Corrugated steel pipe arch
CSS	Cationic Slow-Setting
CT	California Test
CTB	Cement treated base
CV	Check valve
CY	Cubic yard
D	Depth, Load of pipe
db	Decibels
Dbl	Double
DF	Douglas Fir
Dia	Diameter
DIP	Ductile iron pipe
DL	Dead load
DT	Drain tile
Dwg	Drawing
Dwy Appr	Driveway approach
Dwy	Driveway
Ea	Each
EC	End of curve
ECR	End of curb return
EF	Each face
EG	Edge of gutter
EGL	Energy grade line
El	Elevation
ELC	Electrolier lighting conduit
ELT	Extra long ton of slurry
Eng	Engineer, Engineering
EP	Edge of pavement
Esmt	Easement
ETB	Emulsion treated base

Abbreviation	Word or Words
Mon	Monument
MSDS	Material Safety Data Sheet
Mult	Multiple
MUTCD	Manual on Uniform Traffic Control Devices
MVL	Mercury vapor light
N/A	No applicable
NRCP	Nonreinforced concrete pipe
Obs	Obsolete
oc	On center
OD	Outside diameter
OE	Outer edge
Opp	Opposite
Orig	Original
PAV	Pressure Aging Vessel
PB	Pull box
PC	Point of curvature
PCC	Point of compound curvature
PCC	Portland cement concrete
PCVC	Point of compound vertical curve
PE	Polyethylene
PG	Performance Graded
PI	Point of intersection
PL	Property line
PLI	Pounds per linear inch
PMB	Processed miscellaneous base
POC	Point on curve
POT	Point on tangent
PP	Power pole
PRC	Point of reverse curve
PRCB	Precast Reinforced Concrete Box
PRVC	Point of reverse vertical curve
PSI	Pounds per square inch
PT	Point of tangency
PVC	Polyvinyl chloride
Pvmt	Pavement
Pvt R/W	Private right of way
Q	Rate of flow in cms (CFS)
Quad	Quadrangle, Quadrant
R	Radius or Resistance value
R&O	Rock and Oil
R/W	Right of way
RA	Reclaimed Asphalt or Recycling agent
RAC	Recycled asphalt concrete
RAP	Reclaimed asphalt pavement
RBAC	Rubberized asphalt concrete
RC	Reinforced concrete or Rapid Curing
RCB	Reinforced concrete box
RCE	Registered civil engineer
RCP	Reinforced concrete pipe
RCV	Remote control valve
Ref	Reference
Reinf	Reinforced or reinforcement
Res	Reservoir
RGE	Registered geotechnical engineer
RPPCC	Reclaimed Plastic Portland Cement Concrete
RR	Railroad
RSE	Registered structural engineer
RTE	Registered traffic engineer
RTFO	Rolling Thin Film Oven
RW	Reclaimed Water
S	Slope
S/W	Sidewalk
SC	Slow curing
SCCP	Steel cylinder concrete pipe
SCNs	Supplementary Cementitious Materials
SD	Storm drain
SDR	Standard dimension ratio

Abbreviation	Word or Words
EVC	End of vertical curve
Exc	Excavation
Exist or Ex	Existing
Exp Jt	Expansion joint
F & C	Frame and cover
F & I	Furnish and install
F/W	Face of wall
Fab	Fabricate
FAS	Flashing arrow sign
FD	Floor drain
Fdn	Foundation
Fed Spec	Federal Specification
FG	Finished grade
FL	Flow line
FS	Finished surface
ft - lb	foot – pound
Ftg	footing
FW	Face of wall
Ga	Gauge
Galv	Galvanized
GG	Gap graded
GIP	Galvanized iron pipe
GL	Ground line or grade line
GM	Gas meter
GP	Guy pole
Gr	Grade
Grtg	Grating
GSP	Galvanized steel pipe
H	High or height
HB	Hose bib
HC	House connection
HDPE	High density Polyethylene
HDWL	Headwall
HGL	Hydraulic grade line
Hor, Horiz	Horizontal
Hp	Horsepower
HPG	High pressure gas
HPS	High pressure sodium (Light)
HRWRA	High Range Water Reducing Admixture
Hyd, Hydr	Hydraulic
ID	Inside diameter
Incl	Include, Including
Insp	Inspection
Inv	Invert
IP	Iron pipe
J	Joules
JC	Junction chamber
Jct	Junction
JS	Junction structure
Jt	Joint
kg	Kilograms
kPa	KiloPascals
L	Length

Abbreviation	Word or Words
SE	Sand Equivalent
Sec	Section
SF	Square foot
SG	Specific gravity
SI	International System of Units (Metric)
SLC	Service Lateral Connection
Spec	Specifications
SR	Standard ratio
SS	Sanitary sewer
SSB	Select sub-base
SSP	Structural steel plate pipe
SSPA	Structural steel plate pipe arch
St Hwy	State highway
Sta	Station
Std	Standard
Str Gr	Straight grade
Str	Straight
Struc	Structural/Structure
SW	Sidewalk
SWD	Sidewalk drain
SWPPP	Storm Water Pollution Prevention Plan
SY	Square Yard
T/W	Top of wall
Tan	Tangent
TC	Top of curb
TCP	Traffic control plan
Tel	Telephone
TF	Top of footing
Topo	Topography
Tr	Tract
Trans	Transition
TRMAC	Tire rubber modified asphalt concrete
TS	Traffic signal or transition structure
TSC	Traffic signal conduit
TSS	Traffic signal standard
TTC	Temporary traffic control
TW	Top of wall
Typ	Typical
U.S.	United States
U.S.C.	United States Code
USA	Underground Service Alert
Var	Varies, Variable
VB	Valve box
VC	Vertical curve
VCP	Vitrified clay pipe
Vert	Vertical
Vol	Volume
VTCSH	Vehicle Traffic Controls Signal Heads
W	Width or Wider
WATCH	Work Area Traffic Control Handbook
WI	Wrought iron
WM	Water meter
WPJ	Weakened plane joint
WTAT	Wet Track Abrasion Test
X Conn	Cross connection
x (as in 2x4)	by
X-Sec	Cross section

1-3.3 Institutions.

Abbreviation	Word or Words
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGC	Associated General Contractors of America
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
API	American Petroleum Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preserver's Association
AWS	American Welding Society
AWWA	American Water Works Association
CBSC	California Building Standards Commission
CRSI	Concrete Reinforcing Steel Institute
EIA	Electronic Industries Association
EPA	Environmental Protection Agency
ETL	Electrical Testing Laboratories
FCC	Federal Communications Commission
IAPMO	International Association of Plumbing and Mechanical Officials
ICC	International Code Council
IEEE	Institute of Electrical and Electronics Engineers
IMSA	International Municipal Signal Association
ITE	Institute of Traffic Engineers
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NOAA	National Oceanic and Atmospheric Administration (Department of Commerce)
RUS	Rural Utility Service
UL	Underwriters' Laboratories, Inc.
USGS	United State Geological Survey
WFCA	Western Fire Chiefs Association

1-3.4 Building Codes. The Ventura County Building Code (VCBC) and Ventura County Fire Code (VCFC) are applicable to the Work. VCBC and VCFC adopt by reference a number of uniform and national codes. Where such codes are referenced directly in the Specifications, such references shall be to the VCBC or VCFC which adopt and modify certain provisions in the referenced codes.

Abbreviation	Code	Publisher
CBC	California Building Code	CBSC
DBC	Uniform Code for Abatement of Dangerous Building	ICC
UBC	Uniform Building Code	ICC
UFC	Uniform Fire Code	ICC and WFCA
UHC	Uniform Housing Code	ICC
UMC	Uniform Mechanical Code	IAPMO
UPC	Uniform Plumbing Code	IAPMO
NEC	National Electrical Code	NFPA

1-3.5 Reference Documents.

Abbreviation	Document
HDM	Highway Design Manual, State of California, Department of Transportation, Latest Edition
MUTCD	Manual on Uniform Traffic Control Devices
SSP	Standard Plans, State of California, Department of Transportation, latest edition
SPPWC	Standard Plans for Public Works Construction, Latest edition, published by BNi Building News, Los Angeles,
SSPWC	Standard Specifications for Public Works Construction, (See Section 0-1)
SSS	Standard Specifications, State of California, Department of Transportation, latest edition
VCSS	Ventura County Standard Specifications (Division 1, Sections 0 through 10, of which this section is a part)

1-4 UNITS OF MEASURE

1-4.1 General. The International System of Units, also referred to as SI or the metric system, is the principal measurement system in these Specifications and shall be used for construction, unless otherwise stated in the Contract Documents. U. S. Standard Measure, also called U. S. Customary System, are included in parenthesis. SI units and U. S. Standard Measure in parenthesis may or may not be exactly equivalent. If U. S. Standard Measures are specified for use in the Contract Documents, then all values used for construction shall be U. S. Standard Measures shown in parentheses. However, certain material Specifications and test requirements contained herein use SI units specifically and conversions to U. S. Measures have not been included in these circumstances. When U. S. Standard Measures are not included in parentheses, the SI units shall control. Reference is also made to ASTM E 380 for definitions of various units of the SI system and a more extensive set of conversion factors.

1-4.1.1 Units for Work. Where U. S. Standard Measure units are shown on the Plans or are specified, U. S. Standard Measure shall be used for the Work.

1-4.2 Units of Measure, Equivalents and Abbreviations

One U.S. Customary Unit	(abbreviation)	Is Equal To	#	SI Unit
mil (=0.001 in)		25.4	micrometers	(µm)
inch	(in)	25.4	millimeter	(mm)
inch	(in)	2.54	centimeter	(cm)
foot	(ft)	0.3048	meter	(m)
yard	(yd)	0.9144	meter	(m)
mile		1.6093	kilometer	(km)
square foot	(ft^2)	0.0929	square meter	(m^2)
square yard	(yd^2)	0.8361	square meter	(m^2)
cubic foot	(ft^3)	0.0283	cubic meter	(m^3)
cubic yard	(yd^3)	0.7646	cubic meter	(m^3)
acre (=43,560 ft^2)		0.4047	hectare (1ha=10,000m^2)	(ha)
gallon	(gal)	3.7854	Liter	(L)
fluid ounce	(fl. oz.)	29.5735	milliliter	(mL)
pound mass (avoirdupois)	(lbs)	0.4536	kilogram	(kg)
ounce mass	(oz)	0.02835	kilogram	(kg)
ounce mass	(oz)	28.35	grams	(g)
Ton (=2000 lb avoirdupois)		0.9072	Tonne (1 Tonne = 1000 kg)	
Poise		0.10	Pascal-second	(Pa-s)
centistoke	(cs)	1.00	square millimeter/sec.	(mm^2/s)
pound force	(lbf)	4.4482	Newton	(N)
pound per square inch	(psi)	6.8948	Kilopascal	(kPa)
pound force per foot	(lbf/ft)	14.594	Newton per meter	(N/M)
foot-pound force	(ft-lbf)	1.3558	Joules	(J)
foot-pound force per second	([ft-lbf]/s)	1.3558	Watt	(W)
part per million	(ppm)	1.00	milligram/liter	(mg/L)
Degree Fahrenheit	(°F)	0.5555	Degree Celsius	(°C)

Temperature: Celsius to Fahrenheit	Temperature: Fahrenheit to Celsius
Temperature °F = (1.8 x °C) + 32	Temperature °C = (°F - 32) / 1.8

SI Units Used in Both Systems		
Ampere (A)	second (s)	Candela (cd)
Volt (V)	decibel (db)	Lumen (lm)

Common Metric Prefixes					
kilo (k)	10^3	milli (m)	10^{-3}	nano (n)	10^{-9}
centi (c)	10^{-2}	micro (µ)	10^{-6}	pico (p)	10^{-12}

1-5 SYMBOLS

º Degree	P_L Property line	% Percent
' Feet or minutes	S_L Survey line or station line	# Number
" Inches or seconds	C_L Center line	/ per or of (between words)
Δ Delta, the central angle or angle between tangents		∠ Angle

SECTION 2 - SCOPE AND CONTROL OF WORK 2-1

2-1 AWARD AND EXECUTION OF CONTRACT

2-1.1 Award of Contract. The right is reserved to waive minor irregularities in the proposals and to reject any or all proposals. The award of the Contract, if it be awarded, will be to the lowest responsive, responsible Bidder, determined as provided on the Proposal Form, whose Proposal complies with all the requirements prescribed. Such award, if made, will be made within the number of Days stated in the Proposal form. If the lowest responsible Bidder refuses or fails to execute the Contract, the Agency may, within 45 additional Days, consider the next lowest Bidder to be the lowest responsive, responsible Bidder. The periods of time specified above within which the award of Contract may be made shall be subject to extension for such further period as may be agreed upon in writing by the Bidder concerned. If the Bidder's bid guarantee was in the form of a bid bond, the Bidder shall also submit a statement from the Surety that the bond has been extended for the same period.

Proposals not accompanied by a properly executed Noncollusion Affidavit required by Public Contract Code Section 7106 will be considered nonresponsive and will not be considered for award.

All bids will be compared on the basis of the quantities, amounts and unit prices, or lump sums, as shown on the Bid Proposal.

Before award, the Bidder may be required to furnish acceptable evidence of adequate capability, equipment and financial resources to adequately perform the Work. Bidders found not to be so qualified may have their bids rejected. If reasonable cause exists to believe collusion exists among Bidders, or that prices Bid are unbalanced between Bid items, any or all proposals may be rejected.

Award will not be made to a Bidder who is listed by the State Labor Commissioner as ineligible to bid, work on, or be awarded public works projects.

2-1.2 Notice of Award. Within one Day after award of Contract by the Board, the Bidder to whom Contract is awarded will be notified of award by email and telephone, or if no contact is made by telephone, then by mail. Within three business days after award of Contract, a Notice of Award will be sent, transmitting the Contract Documents to such Bidder for execution. If telephone contact is made, the Bidder may request that the Contract Documents be held in Agency's office to be picked up.

2-1.3 Execution of Contract Documents. On receipt of the Contract Documents, the Bidder shall promptly obtain the required insurance coverage, certificates of insurance, power-of-attorney and Contract bonds, execute the Contract, and transmit all required documents to the Agency.

2-1.4 Failure to Execute Documents. Should the Bidder fail to furnish Agency all required documents, properly executed, prior to the starting day of the Contract time computed as provided in 6-7.4 and stated in the Notice of Award, Agency may thereafter declare the Bidder to be in default and its Proposal guarantee forfeited.

2-1.5 Return of Proposal Guarantees. Within 10 Days after the award of the Contract, Agency will return the Proposal guarantees, other than Bidder's bonds, accompanying such of the proposals as are not to be further considered in making the award. The low and second Bidder's Proposal guarantee will be held until the Contract has been executed, after which all Proposal guarantees, except Bidders' bonds and any guarantees which have been forfeited, will be returned to the respective Bidders whose proposals they accompany.

2-2 ASSIGNMENT. No Contract or portion thereof may be assigned without consent of the Board except that the Contractor may assign money due or which will accrue to it under the Contract. If given written notice, such assignment will be recognized by the Board to the extent permitted by law, but any assignment of money shall be subject to all proper withholdings in favor of the Agency and to all deductions provided for in the Contract. All money withheld, whether assigned or not, shall be subject to being used by the Agency for completion of the Work, should the Contractor be in default.

2-3 SUBCONTRACTS.

2-3.1 General. Each Bidder shall comply with the Chapter of the Public Contract Code including Sections 4100 through 4113. The following excerpts or summaries of some of the requirements of that Chapter are included below for information.

The Bidder shall set forth in the Bid, as provided in 4104:

"(a) (1) The name, the location of the place of business, and the California contractor license number of each subcontractor who will perform work or labor or render service to the prime contractor in or about the construction of the work or improvement, or a subcontractor licensed by the State of California who, under subcontract to the prime contractor, specially fabricates and installs a portion of the work or improvement according to detailed drawings contained in the plans and specifications, in an amount in excess of one- half of 1 percent of the prime contractor's total bid or, in the case of bids or offers for the construction of streets or highways, including bridges, in excess of one-half of 1 percent of the prime contractor's total bid or ten thousand dollars ($10,000), whichever is greater.

(2) An inadvertent error in listing the California contractor license number provided pursuant to paragraph (1) shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive if the corrected contractor's license number is submitted to the public entity by the prime contractor within 24 hours after the bid opening and provided the corrected contractor's license number corresponds to the submitted name and location for that subcontractor."

If the Contractor fails to specify a Subcontractor, or specifies more than one Subcontractor for the same portion of the Work to be performed under the Contract (in excess of one-half of 1 percent of the Contractor's total bid), the Contractor shall be qualified to perform that portion itself, and shall perform that portion itself except as otherwise provided in the Code.

Except as provided in Section 4107, no prime contractor, whose Bid is accepted, shall substitute any person or Subcontractor in place of the Subcontractor listed in the original bid other than for causes and by procedures established in Section 4107.5 which provides procedures to correct a clerical error in the listing of a Subcontractor.

Section 4110 provides that a Contractor violating any of the provisions of the Chapter violates the Contract and the Board may exercise the option either to cancel the Contract or assess the Contractor a penalty in an amount of not more than 10 percent of the subcontract involved, after a public hearing.

2-3.1.1 Use of Debarred Subcontractors Prohibited. The Contractor is prohibited from performing work using a Subcontractor who is listed by the State Labor Commissioner as ineligible to work on public works projects.

2-3.2 Additional Responsibilities. The Contractor shall give personal attention to the fulfillment of the Contract and shall keep the Work under its control.

Except where the required Contractor's License Class is "B", the Contractor shall perform, with its own organization, Contract work amounting to at least 50 percent of the Contract Price except that any designated "Specialty Items" may be performed by subcontract and the amount of any such "Specialty Items" so performed may be deducted from the Contract Price before computing the amount required to be performed by the Contractor with its own organization. "Specialty Items" will be identified by the Agency in the Bid or Proposal with an "[S]". Where an entire item is subcontracted, the value of work subcontracted will be based on the Contract Unit Price. This will be determined from information submitted by the Contractor, and subject to approval by the Engineer.

Before the work of any Subcontractor is started, the Contractor shall submit to the Engineer for approval a written statement showing the work to be subcontracted giving the name, contractor license number, registration with the Department of Industrial Relations, and business of each Subcontractor and description and value of each portion of work to be subcontracted.

2-3.3 Status of Subcontractors. Subcontractors shall be considered employees of the Contractor, and the Contractor shall be responsible for their work.

2-3.3.1 Subcontracts. The Contractor shall incorporate into all subcontracts, and the Subcontractor shall incorporate into all lower tier subcontracts, all of the Plans and Specifications which are part of the Contract between the Contractor and the Agency.

2-3.3.2 Contractor Responsible. The Contractor is responsible for properly performing and completing all Work required by the Contract whether or not it employs subcontractors for certain portions of the Work. It shall coordinate the sequence and timing of its efforts and that of its subcontractors to insure the proper and timely completion of the Work.

2-3.3.3 Specialty Contractors. Where a specialty Contractor's license is required by law or by the Specifications in order to perform certain portions of the Work, the Contractor may perform such portion with its own forces if it holds the proper license. Otherwise, it shall employ a properly licensed subcontractor to perform that portion of the Work. Such requirement to employ a subcontractor does not modify the other requirements of 2-3.

2-4 CONTRACT BONDS. Before execution of the Contract by the Agency, the Bidder shall file surety bonds with the Agency to be approved by the Board in the amounts and for the purposes noted below. Bonds issued by a Surety who is listed in the latest version of U.S. Department of Treasury Circular 570, who is authorized to issue bonds in California, and whose bonding limitation shown in said circular is sufficient to provide bonds in the amount required by the Contract shall be deemed to be approved unless specifically rejected by the Agency. Bonds from all other sureties shall be accompanied by all of the documents enumerated in Code of Civil Procedure 995.660(a). The Bidder shall pay all bond premiums, costs, and incidentals.

Each bond shall incorporate, by reference, the Contract and be signed by both the Bidder and Surety and the signature of the authorized agent of the Surety shall be notarized.

The Bidder shall provide two good and sufficient surety bonds. The "Payment Bond" (Material and Labor Bond) shall be for not less than 100 percent of the Contract Price, to satisfy claims of material suppliers and mechanics and laborers employed by it on the Work. The bond shall be maintained by the Contractor in full force and effect until the Work is accepted by the Agency, and until all claims for materials and labor are paid, and shall otherwise comply with the Civil Code.

The "Performance Bond" shall be for 100 percent of the Contract Price to guaranty faithful performance of all Work, within the time prescribed, in a manner satisfactory to the Agency, and that all materials and workmanship will be free from original or developed defects. The bond must remain in effect until the end of the warranty period set forth in 6.8-2.

Should any bond become insufficient, the Contractor shall renew the bond within 10 Days after receiving notice from the Agency.

Should any Surety at any time be unsatisfactory to the Board, notice will be given the Contractor to that effect. No further payments shall be deemed due or will be made under the Contract until a new Surety shall qualify and be accepted by the Board.

Changes in the Work, or extensions of time, made pursuant to the Contract, shall in no way release the Contractor or Surety from its obligations. Notice of such changes or extensions shall be waived by the Surety.

2-4.1 Bond Forms. Bonds shall be on forms furnished by Agency.

2-5 PLANS AND SPECIFICATIONS

2-5.1 General. The Contractor shall keep at the work site a copy of the Plans and Specifications, to which the Engineer shall have access at all times.
The Plans, Specifications, and other Contract Documents shall govern the Work. The Contract Documents are intended to be complementary and cooperative. Anything specified in the Specifications and not shown on the Plans, or shown on the Plans and not specified in the Specifications, shall be as though shown or specified in both.

The Plans shall be supplemented by such working drawings and shop drawings as are necessary to adequately control the Work.

The Contractor shall ascertain the existence of any conditions affecting the cost of the Work through reasonable examination of the work site prior to submitting the Bid..

Existing improvements visible at the work site, for which no specific disposition is made on the Plans, but which interfere with the completion of the Work, shall be removed and disposed of by the Contractor.

The Contractor shall, upon discovering any error or omission in the Plans or Specifications, immediately call it to the attention of the Engineer.

2-5.1.1 Specifications Captions. Captions accompanying specification parts, sections and paragraphs are for convenience of reference only and do not limit the content of such part, section or paragraph.

The division of the Plans into parts and the division of the Specifications into divisions and sections are for the ease of reference only and does not imply the division of work between trades or subcontractors.

2-5.2 Precedence of Contract Documents. If there is a conflict between any of the Contract Documents, the document highest in precedence shall control. The precedence shall be as follows:

1) Laws, Governing Regulations, Permits, and Current Prevailing Wage Rates.
2) Change Orders and Supplemental Agreements; most recent governing.
3) Executed Contract.
12) Federal Contract Provisions for AIP Program Projects
13) Notice Inviting Bids
14) Instructions to Bidders.

4) Bid Addenda.
5) Proposal Documents: Price Adjustments.
6) Proposal Documents: Bid Schedule.
7) Project Specific Requirements for Airport Construction: Technical Specifications.
8) Project Specific Requirements for Airport Construction: CSPP.
9) Project Specific Requirements for Airport Construction: All other documents not previously referenced in this list.
10) FAA Standard Specifications for Construction of Airports: Parts 3-13.
11) FAA Standard Specifications for Construction of Airports: Part 2
15) FAA Standard Specifications for Construction of Airports: Part 1.
16) Proposal Forms: All other documents not previously mentioned on this list.
17) OXR Drawings (Detail drawings taking precedence over planimetric drawings).
18) County of Ventura Standard Specifications.
19) All other documents not previously referenced in this list.
20) Reference documents.

For any conflicts between items of equal precedence or within an item, precedence shall be given to the test that appears first in the document.

2-5.3 Shop Drawings, Working Drawings, and Submittals.

2-5.3.1 General. Submittals shall be provided, at the Contractor's expense, as required in 2-5.3.2, 2-5.3.3 and 2-5.3.4, when required by the Plans or Special Provisions, or when requested by the Engineer.

Materials shall neither be furnished nor fabricated, nor shall any work for which submittals are required be performed, before the required submittals have been reviewed and accepted by the Engineer. Neither review nor acceptance of submittals by the Engineer shall relieve the Contractor from responsibility for errors, omissions, or deviations from the Contract Documents, unless such deviations were specifically called to the attention of the Engineer in the letter of transmittal. The Contractor shall be responsible for the correctness of the submittals.

The Contractor shall allow a minimum of 20 working days for review of submittals unless otherwise specified in the Special Provisions. Each submittal shall be accompanied by a letter of transmittal.

2-5.3.2 Working Drawings. Working drawings shall be of a size and scale to clearly show all necessary details.

Six copies and one reproducible shall be submitted. If no revisions are required, 3 of the copies will be returned to the Contractor. If revisions are required, the Engineer will return one copy along with the reproducible for resubmission. Upon acceptance, the Engineer will return 2 of the copies to the Contractor and retain the remaining copies and the reproducible.

Working drawings are required in the following subsections:

TABLE 2-5.3.2 (A)

Item	Section Number	Title	Subject
1	7-8.5.2	Sanitary Sewers	Sewage Bypass and Pumping
2	7.8.6.3	Water Pollution Control	Storm Water Pollution Prevention Plan
3	7-8.6.6	Water Pollution Control	Dewatering Plan
4	7-10.2.2	Work Area Traffic Control	Traffic Control Plan
5	7-10.4..2.2	Safety	Trench Shoring
6	207-8.4	Joints	Vitrified Clay Pipe
7	207-10.2.1	General	Fabricated Steel Pipe
8	300-3.2	Cofferdams	Structure Excavation & Backfill
9	303-1.6.1	General	Falsework
10	303-1.7.1	General	Placing Reinforcement
11	303-3.1	General	Prestressed Concrete Construction
12	304-1.1.1	Shop Drawings	Structural Steel
13	304-1.1.2	Falsework Plans	Structural Steel
14	304-2.1	General	Metal Hand Railings
15	306-2.1	General	Jacking Operations
16	306-3.1	General	Tunneling Operations
17	306-3.4	Tunnel Supports	Tunneling Operations
18	306-6	Remodeling Existing Sewer Facilities	Polyethylene Liner Installation
19	306-8	Microtunneling	Microtunneling Operations

Working drawings listed above as Items 4, 5, 8, 9, 11, 12, 13, 15 and 18 shall be prepared by a Civil or Structural Engineer registered by the State of California.

2-5.3.3 Shop Drawings. Shop drawings are drawings showing details of manufactured or assembled products proposed to be incorporated into the Work. Shop drawings required shall be as specified in the Special Provisions.

2-5.3.4 Supporting Information. Supporting information is information required by the Specifications for the purposes of administration of the Contract, analysis for verification of conformance with the Specifications, the operation and maintenance of a manufactured product or system to be constructed as part of the Work, and other information as may be required by the Engineer. Six copies of the supporting information shall be submitted to the Engineer prior to the start of the Work unless otherwise specified in the Special Provisions or directed by the Engineer. Supporting information for systems shall be bound together and include all manufactured items for the system. If resubmittal is not required, three copies will be returned to the Contractor. Supporting information shall consist of the following and is required unless otherwise specified in the Special Provisions:

1) List of Subcontractors per 2-3.2.
2) List of Materials per 4-1.4.
3) Certificates of Compliance per 4-1.5.
4) Construction Schedule per 6-1.
5) Spill Prevention and Emergency Response Plan per 7-8.5.3
6) Confined Space Entry Program per 7-10.4.5.1
7) Lean concrete base mix designs per 200-4
8) Concrete mix designs per 201-1.1.
9) Asphalt concrete mix designs per 203-6.1.
10) Pipeline layout diagrams per 207-2.1
11) Equipment and materials list per 307-1
12) Controller cabinet wiring diagrams per 307-17.2.2
13) Data, including, but not limited to, catalog sheets, manufacturer's brochures, technical bulletins, specifications, diagrams, product samples, and other information necessary to describe a system, product or item. This information is required for irrigation systems, street lighting systems, and traffic signals, and may also be required for any product, manufactured item, or system.

2-5.4 Record Drawings. The Contractor shall prepare and maintain a set of prints in the Engineer's Field Office on which the locations and description of all plumbing, mechanical, and electrical facilities, which were not detailed fully on the Plans, are marked in colored pencil. Such prints shall also indicate any authorized changes from the original Plans. Such prints shall be furnished to the Engineer before final Acceptance of the Work.

2-6 WORK TO BE DONE. The Contractor shall perform all work necessary to complete the Contract in a satisfactory manner. Unless otherwise provided, it shall furnish all materials, equipment, tools, labor and incidentals necessary to complete the Work.

All work under the Contract shall be performed in accordance with the highest standards prevailing in the trades unless otherwise specified on the Plans or in the Special Provisions. Unless otherwise specified, it is the intent that the Contractor will construct a complete facility ready for use.

2-6.1 Manufacturer's Recommendations. Where the manufacturer of any materials or equipment provides written recommendations or instructions for its use or method of installation (including labels, tags, manuals, or trade literature), such recommendations or instructions shall be complied with except where the Contract Documents specifically require deviations.

2-6.2 Testing of Installed Components. Where the specifications provide that any component of the Work is to be tested, calibrated or adjusted during or after installation, such testing shall be performed by a qualified firm, approved by the Engineer. The firm performing the testing or calibration shall be employed by and paid for by the Contractor.

2-6.3 Training of Agency Personnel. Where the specifications provide for training of Agency personnel in the use or maintenance of any component of the Work, the Contractor shall arrange for and pay for competent personnel to perform the training. Contractor shall schedule the training with the Engineer.

2-7 SUBSURFACE DATA. All soil and test hole data, groundwater elevations, and soil analyses shown on the Plans or included in the Specifications apply only at the location of the test holes and to the depths shown. Soil test reports for test holes which have been drilled are available for inspection at the office of the Engineer. Additional subsurface exploration may be performed by Bidders or the Contractor at their own expense.

The indicated groundwater elevation is that existing at the date specified in the data. It is the Contractor's responsibility to determine and allow for the groundwater elevation on the date the Work is performed. A difference in groundwater elevation between what is shown in soil boring logs and what is actually encountered during construction will not be considered as a basis for Extra Work per 3-3.

Opinions, recommendations or conclusions contained in any soils report, soil boring logs, subsurface materials investigation, geological report or other similar studies, tests or reports, prepared for the Agency, are not a part of the Contract. Contractor shall be responsible for forming its own opinions and conclusions from the facts set forth in such reports.

2-8 RIGHTS-OF-WAY. Rights-of-way, easements or rights-of-entry for the Work will be provided by the Agency. Unless otherwise provided, the Contractor shall make arrangements, pay for, and assume all responsibility for acquiring, using, and disposing of additional work areas and facilities temporarily required. The Contractor shall indemnify and hold the Agency harmless from all claims for damages caused by such actions.

2-9 SURVEYING

2-9.1 Permanent Survey Markers. The Contractor shall notify the Engineer at least 7 Days before starting work to allow for the preservation of survey monuments, lot stakes (tagged), and bench marks. The Engineer, or the owner at its cost, shall file a Corner Record Form referencing survey monuments subject to disturbance in the Office of the County Surveyor prior to the start of construction and also prior to the completion of construction for the replacement of survey monuments. The Contractor shall not disturb survey monuments, lot stakes (tagged), or bench marks without the consent of the Engineer or the owner on Private Contracts. The Contractor shall bear the expense of replacing any that may be disturbed without permission. Replacement shall be done only under the direction of the Engineer by a Licensed Land Surveyor or a Registered Civil Engineer authorized to practice land surveying within the state.

When a change is made in the finished elevation of the pavement of any roadway in which a permanent survey monument is located, the Contractor shall adjust the monument cover to the new grade within 7 Days of finished paving unless otherwise specified.

2-9.2 Survey Service. The Engineer will set only the horizontal and vertical control survey points shown on the Plans. These will be set prior to the commencement of construction. The Contractor shall preserve these points as well as any other surveys established by the Engineer for use by the Contractor for the duration of their usefulness. If any survey points established by Engineer are lost or disturbed and need to be replaced, such replacement shall be by the Engineer at the expense of the Contractor. The Contractor shall employ engineers or surveyors to perform adequate surveys and staking necessary to construct the Work to the lines, elevations and grades shown on the Plans and for the Engineer's use in checking such work. Copies of the field notes or diagrams used in setting stakes shall be promptly furnished to the Engineer.

2-9.2.1 Open Areas. Where dimensions are not given on the Plans for parking lots, landscaped areas or graded areas, distances shall be scaled. Unless otherwise indicated, straight grades and smooth vertical curves shall be set between indicated elevations. Finished surfaces shall be sloped to drain in order to eliminate ponding of water.

2-9.2.2 Utilities. Section 5-5.1 requires the Contractor's cooperation during the relocation of utilities, which may require the setting of lines and grades when needed by utility owners performing relocations.

2-9.3 Contractor's Surveys. Surveying by private engineers and surveyors on the Work shall conform to the quality and practice required by the Engineer.

2-9.3.1 Errors in Surveys. The Contractor is responsible for the accuracy of all surveys except those performed by the Engineer. To assure that a survey point set by the Engineer has not been disturbed since it was set and that it was accurately set, all surveys by the Contractor shall be based on at least two survey points set by the Engineer or by other governmental surveys, in accordance with good survey practice. Should discrepancies be found between such points, the Engineer shall be notified and construction shall not proceed until the discrepancy has been resolved.

2-9.4 Line and Grade. All Work upon completion shall conform to the lines, elevations, and grades shown on the Plans.

2-9.5 Quantity Surveys. The Engineer will perform all quantity surveys for payment purposes, however, in performing such quantity surveys, it may make use of surveys performed by the Contractor.

2-9.6 Payment for Surveys. Payment for performing all of the surveying and staking as required by the Specifications and such additional surveying and staking as required by the Contractor will be made at the lump sum price set forth in the Proposal and shall be full compensation for furnishing all labor, equipment, instruments and materials necessary to perform the Work. If no bid item for surveying is included in the Proposal, the cost of surveying shall be included in the prices bid for other applicable items of work.

2-10 AUTHORITY OF BOARD AND ENGINEER. The Board has the final authority in all matters affecting the Work. Within the scope of the Contract, the Engineer has the authority to enforce compliance with the Plans and Specifications. The Contractor shall promptly comply with instructions from the Engineer or its authorized representative.

On all questions relating to quantities, the acceptability of material, equipment, or work, the execution, progress or sequence of work, and the interpretation of Specifications or drawings, the decision of the Engineer is final and binding, and shall be precedent to any payment under the Contract, unless otherwise ordered by the Board.

2-10.1 Decisions in Writing. Any and all decisions of the Engineer interpreting Specifications or drawings shall be in writing. Any purported "interpretation" which is not in writing shall not be binding upon the Agency and should not be relied upon by the Contractor.

2-11 INSPECTION

The Work is subject to inspection and approval of the Engineer. The Contractor shall notify the Engineer before noon of the working day before inspection is required. Work shall be done only in the presence of the Engineer, unless otherwise authorized. Any work done without proper inspection will be subject to rejection. The Engineer and any authorized representatives shall at all times have access to the Work during its construction at shops and yards as well as the Work site. The Contractor shall provide every reasonable facility for ascertaining that the materials and workmanship are in accordance with these specifications. Inspection of the Work shall not relieve the Contractor of the obligation to fulfill all conditions of the Contract.

2-11.1 Permit Inspections. The Contractor shall arrange for code compliance inspections by all agencies issuing permits for the Work. The Work shall not continue beyond mandatory inspection points without clearance from the controlling agency. Each agency involved shall be notified in accordance with the code they enforce or in accordance with their standard operating procedures. No extensions of time will be granted for delays occasioned by such inspections except where, through no fault of the Contractor, the inspection is delayed more than one Day beyond normal response time after proper notification has been given.

It shall be the Contractor's responsibility to see that any required inspection record card is signed off before proceeding with the next phase of the Work and completely signed off on completion of the Work.

2-11.2 Structural Observation. When the plans indicate that "Structural Observation" of specific work is required prior to Permit Inspection, Contractor shall notify Engineer, in writing, at least five working days prior to the date Contractor plans to have the work ready for structural observation. If the work is not ready for structural observation on the date indicated, Contractor shall reimburse Agency the cost of structural observer's visit to the Work site. If the work to be observed is substantially complete but is found to need correction before approval by the structural observer, Contractor shall give notice of a new date, as required above.

2-12 SPECIAL NOTICES. When specified in the Specifications or as directed by the Engineer, any notice required to be given in accordance with this subsection shall be in writing, dated, and signed by the Contractor or the Engineer. Such notices shall be served by any of the following methods:

a) Personal delivery with proof of delivery which may be made by declaration under penalty of perjury by any person over the age of 18 years. The proof of delivery shall show that delivery was performed in accordance with these provisions. Service shall be effective on the date of delivery. Notices given to the Contractor by personal delivery may be made to the Contractor's authorized representative at the Work site; or

b) Certified mail addressed to the mailing address of the recipient postage prepaid; return receipt requested. Service shall be effective on the date of the receipt of the mailing.

Simultaneously, the Agency may send the same notice by regular mail. If a notice that is sent by certified mail is returned unsigned, then delivery shall be effective pursuant to regular mail, provided the notice that was sent by regular mail is not returned.

2-13 AGENCY PERSONNEL AND AUTHORITY

2-13.1 General. The Board has complete authority for the project within the limits prescribed by law. Pursuant to resolutions duly adopted by the Board, the authority to perform certain functions has been delegated to the Director of Airports. Agency staff personnel and Consultants delegated thereto by the Director are authorized to perform functions limited as set forth in the following list of personnel and designated duties.

2-13.2 Chief Executive Officer (CEO). The Chief Executive Officer (CEO) of the County of Ventura has general authority to administer the Contract. The CEO has the following specific authority:

(a) To issue Contract Change Orders (CCO) and to settle claims subsequent to Acceptance as follows:

Original Contract Amount	Maximum Amount of any Change Order or Claim Settlement
$50,000 or less……..	$5,000
greater than $50,000 and not over $250,000……..	10% of the original Contract amount
greater than $250,000 and not over $3,950,000……..	$25,000 plus 5% of the original Contract cost in excess of $250,000.
greater than $3,950,000……...	$210,000

CCOs and claim settlements exceeding the amounts set forth above require Board approval.

(b) To suspend the Work for the benefit of the Agency.

(c) To issue extensions of Contract Time in accordance with the Contract Documents in excess of 10% of the Contract Time or 60 Working Days, whichever is greater.

2-13.3 Director of Airports(Director). The Director of Airports is the Engineer and has specific authority as a Deputy Executive Officer to Administer the Contract. The Director has the following authority:

(a) To issue Contract Change Orders (CCO) as follows:

Original Contract Amount	Maximum Amount of any Change Order
Less than $500,000…….....	$5,000
$500,000 to $1,000,000…….....	1% of Bid Price
Greater than $1,000,000……..	$10,000

(b) To issue extensions of Contract time in accordance with the Contract Documents up to 10% of the Contact Time or 60 Working Days, whichever is greate

(c) To make final adjustment of quantities where the total does not exceed the amounts listed in (a) above.

(d) To approve the substitution of subcontractors, where allowed by law, if the listed Subcontractor does not object when notified.

(e) To determine when the Work has been completed and acknowledge in writing the completion of the Work.

(f) To accept the Work when the Contractor has completed all obligations of the Contract, in accordance with the Plans, Specifications and other Contract Documents. The Engineer also has authority to make and record the Notice of Completion.

(g) To approve progress and final payments under the Contract, including the provisions for withholding funds.

(h) To determine whether performance on the Work is satisfactory. Satisfactory performance includes compliance with all contract requirements.

(i) In the absence of the Agency Director, a Deputy Director of Airports, may exercise the Engineer's authority. Such action will be indicated by "Acting" with the Department Director's signature.

2-13.4 Project manager. The Project manager responsible for the project is designated in the Notice to Proceed. This person may also be referred to as Project Engineer. The Project manager has the following authority:

(a) To interpret the Plans and Specifications.

(b) To make minor changes in the location or features of the Work where no change in cost is involved. Such changes in cost may not be the net of multiple changes.

(c) To approve substitutes for material and equipment specified by proprietary names when such material and equipment meet the Contract requirements.

(d) To approve shop drawings and submittals.

(e) To issue stop work orders when necessary to enforce the provisions of the Contract.

(f) To make determinations of each Working Day to be charged against the Contract time in accordance with 6-7.3.

(g) To take over a portion of the Work for Agency's use in accordance with 6-10.

(h) To receive all correspondence and other documents from the Contractor.

(i) To inspect the Work and perform Final Inspection subject to review by the Department Director and the Engineer.

2-13.5 Inspector. One or more inspectors will be assigned to the project by the Project manager. Substitutes may be used during absence of the assigned inspector. The Inspector has the following authority subject to review by the Project manager, Department Director and the Engineer:

(a) To view and inspect the Work, sample and test components (at the Work site and at offsite manufacturing locations), and to discuss the Work with the Contractor's field representative.

(b) To determine compliance with the Plans, Specifications and other Contract Documents and to issue warnings of noncompliance.

(c) To issue stop work notices in the following two instances only:

1) Where a safety hazard exists that has an immediate potential for serious injury or death.

2) Where the operation in progress, if continued for even a short period of time, could be adverse to the Agency's interests.

2-13.6 Other Agency Personnel and Consultants.

2-13.6.1 Materials Engineer. The Materials Engineer is designated in the Notice to Proceed. The Materials Engineer may assign one or more Materials Inspectors to the project.

Materials Inspectors have authority to sample and test material at the Work site and at offsite manufacturing or storage locations. They may furnish available written test results to the Contractor's field representative. At batch plants, they may issue warnings of noncompliance, but stop notices require the signature of the Materials Engineer or Project manager.

2-13.6.2 Surveyors & Technicians. Surveyors and technicians shall have free access to the site to perform their duties but have no authority related to Contract administration.

2-13.6.3 Other Persons. Other Agency personnel who are not involved in construction administration and the general public may be present at the site because it is their present place of work, as client/customers, as visitors, as future users of the facility, or as persons who will maintain the completed facility. Where the facility is to continue in use during construction, work access for Agency workers and client/customers shall be maintained as provided in the Special Provisions. Where the facility (or portion where construction is being performed) is not in use during construction, admittance to the Work site by Agency personnel not involved in construction administration and visitors may be allowed by the Contractor or by the inspector, subject to compliance with safety regulations. Such persons have no authority under the Contract and the Agency is not responsible for their comments, suggestions or directions.

2-13.6.4 Consultants. Consultants hired by the Agency shall have free access to the site to perform their duties but have no authority related to Contract administration, unless such duties are specifically identified in writing to the Contractor. When so identified, Consultant may perform the duties of certain Agency personnel described above.

SECTION 3 - CHANGES IN WORK

3-1 CHANGES REQUESTED BY THE CONTRACTOR

3-1.1 General. Changes in specified methods of construction may be made at the Contractor's request when approved in writing by the Engineer. Changes in the Plans and Specifications, requested in writing by the Contractor, which do not materially affect the Work and which are not detrimental to the Work or to the interests of the Agency, may be granted by the Board to facilitate the Work, when approved in writing by the Engineer. Nothing herein shall be construed as granting a right to the Contractor to demand acceptance of such changes.

3-1.2 Payment for Changes Requested by the Contractor. If such changes are granted, they shall be made at a reduction in cost or at no additional cost to the Agency. All costs to the Agency in reviewing the proposed change, or testing materials involved therein, shall be paid for by the Contractor, whether or not the change is approved.

3-2 CHANGES INITIATED BY THE AGENCY

3-2.1 General. The Agency may change the Plans, Specifications, character of the Work, or quantity of work, provided the total arithmetic dollar value of all such changes, both additive and deductive, does not exceed 25 percent of the Contract Price. Should it become necessary to exceed this limitation, the change shall be by written Supplemental Agreement between the Contractor and Agency, unless both parties agree to proceed with the change by Change Order.

Change orders shall be in writing and state the dollar value of the change or establish method of payment, any adjustment in Contract time, and, when negotiated prices are involved, shall provide for the Contractor's signature indicating its acceptance.

3-2.2 Payment for Changes Initiated by the Agency.

3-2.2.1 Contract Unit Prices. If a change is ordered in an item of work covered by a Contract unit price, and such change does not involve a substantial change in the character of the Work from that shown on the Plans or included in the Specifications, an adjustment in payment will be made based upon the increase or decrease in quantity and the Contract unit price. In the case of such an increase or decrease in a Major Bid Item, the use of this basis for the adjustment of payment will be limited to that portion of the change which, together with all previous changes to that item, is not in excess of 25% of the total cost of such item based on the original quantity and Contract unit price.

If a change is ordered in an item of work covered by a Contract unit price, and such change does involve a substantial change in the character of the Work from that shown on the Plans or included in the Specifications, an adjustment in payment will be made in accordance with 3-2.2.3.

Should any Contract item be deleted in its entirety, payment will be made only for actual costs incurred prior to notification of such deletion.

3-2.2.2 Stipulated Unit Prices. Stipulated unit prices are those established by the Agency in the Contract Documents, as distinguished from Contract unit prices submitted by the Contractor. Stipulated unit prices may be used for the adjustment of Contract changes.

3-2.2.3 Pricing. Adjustments in payments for changes other than those set forth in 3-2.2.1 and 3-2.2.2 will be determined by agreement between Contractor and Agency. If unable to reach agreement, the Agency may direct the Contractor to proceed on the basis of Extra Work in accordance with 3-3 or as set forth in 3-2.2.4.

3-2.2.4 Non-Agreed Prices. Agency may issue a change order directing the Contractor to proceed at a price set by the Agency or on the basis of Extra Work. If the Agency sets a price for the work covered by the change order, Contractor is entitled to payment for such work in accordance with 3-3 to the extent payment in accordance with 3-3 exceeds the price set by the Agency.

3-3 EXTRA WORK

3-3.1 General. New or unforeseen work will be classed as "Extra Work" when the Engineer determines that it is not covered by Contract Unit Prices or Stipulated Unit Prices.

3-3.2 Payment.

3-3.2.1 General. When the price for the Extra Work cannot be agreed upon, the Agency will pay for the Extra Work based on the accumulation of costs as provided herein.

3-3.2.2 Basis for Establishing Costs

(a) Labor. The cost of labor will be the current cost for wages prevailing for each craft or type of workers performing the Extra Work at the time the Extra Work is done, plus payment of health and welfare, pension, vacation, apprenticeship funds, and other direct costs included in the prevailing rates applicable to the project, as well as assessments or benefits required by lawful collective bargaining agreements. To the total of these labor costs, the labor surcharge set forth in the current CALTRANS Labor Surcharge and Equipment Rental Rates publication shall be applied.

The use of a labor classification which would increase the Extra Work cost will not be permitted unless the Contractor establishes the necessity for such additional costs.

Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for the equipment rental. The labor cost for foremen shall be proportioned to all of their assigned work and only that applicable to Extra Work shall be paid. A foreman is defined as a lead working journeyman.

Nondirect labor costs including superintendence, payroll taxes, all types of insurance, and all other labor costs, not specifically provided for, shall be considered to be paid for as part of the markup of 3-3.2.3(a)(1).

(b) Materials. The cost of materials reported shall be at invoice or lowest current price at which such materials are locally available and delivered to the Work site in the quantities involved, plus sales tax, freight and delivery.

The Agency reserves the right to approve materials and sources of supply, or to supply materials to the Contractor if necessary for the progress of the Work. No markup shall be applied to any material provided by the Agency.

(c) Tool and Equipment Rental. No payment will be made for the use of tools which have a replacement value of $200 or less.

Regardless of ownership, the rates to be used for determining equipment rental costs shall not exceed the following:

(1) For equipment that is listed in the current CALTRANS Labor Surcharge and Equipment Rental Rates publication, the rates shown therein. The right of way delay and overtime/multiple shift factors contained therein shall be used as applicable.

(2) For equipment not listed in said CALTRANS publication, the listed rates prevailing locally at equipment rental agencies, or distributors, at the time the work is performed.

(3) For equipment rental that includes operators and helpers, the applicable cost from (1) or (2) above, plus the applicable labor costs as determined in accordance with (a) above.

The rental rates paid shall include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals.

Necessary loading and transportation costs for equipment used on the Extra Work shall be added to the other costs.

If equipment is used intermittently and, when not in use, could be returned to its rental source at less expense to the Agency than holding it at the work site, it shall be returned, unless the Contractor elects to keep it at the work site at no expense to the Agency.

All equipment shall be acceptable to the Engineer, in good working condition, and suitable for the purpose for which it is to be used. Manufacturer's ratings and manufacturer's approved modifications shall be used to classify equipment and it shall be powered by a unit of at least the minimum rating recommended by the manufacturer.

The reported rental rates for equipment already at the work site shall be for the duration of its use on the Extra Work, commencing at the time it is first put into actual operation on the Extra Work, plus the time required to move it from its previous site, and move it back to its previous site or to a closer site of next use.

3-3.2.2 Basis for Establishing Costs (Continued)

(d) Other Items. The Agency may authorize other items which may be required on the Extra Work. Such items include labor, service, material and equipment which are different in their nature from those required for the Work specified in the Contract and which are of a type not ordinarily available from the Contractor or any of its subcontractors.

Invoices covering all such items in detail shall be submitted with the request for payment.

(e) Invoices. Vendors' invoices for material, equipment rental, and other expenditures, shall be submitted with the request for payment. If the request for payment is not substantiated by invoices or other documentation, the Agency may establish the cost of the item involved at the lowest price which was current at the time of the report.

3-3.2.3 Markup

(a) Work by Contractor. The following percentage shall be added to the Contractor's costs and shall constitute the markup for all overhead and profits, and all other cost not specifically provided for:

(1) Labor 15%
(2) Materials 15%
(3) Equipment Rental 15%
(4) Other Items and Expenditures ... 15%

To the sum of the cost and markups provided for in this section, 1 percent shall be added as compensation for bonding.

(b) Work by Subcontractor. When all or any part of the Extra Work is performed by a Subcontractor, the markup established in 3-3.2.3(a) shall be applied to the Subcontractor's actual cost of such work. A markup of 10% on the first $5,000 of the subcontracted portion of the Extra Work and a markup of 5% on work in excess of $5,000 of the subcontracted portion of the Extra Work may be added by the Contractor.

3-3.3 Daily Extra Work Reports by Contractor. When the price for the Extra Work cannot be agreed upon, the Contractor shall submit a Daily Extra Work Report to the Engineer on forms furnished by the Agency, together with applicable delivery tickets, listing all labor, materials, and equipment involved for that day, and for other services and expenditures when authorized. Failure to submit the Daily Extra Work Report, showing the labor and equipment hours and the quantity of materials used, by the close of the next Working Day may waive any rights for that day. Failure to submit fully completed Daily Extra Work Reports, with the required supporting documentation, within ten calendar days after the Engineer makes a written request for the such reports shall waive all rights for the work covered by the requested reports. An attempt shall be made to reconcile the Daily Extra Work Report daily, and it shall be signed by the Engineer and the Contractor. In the event of disagreement, pertinent notes shall be entered by each party to explain points which cannot be resolved immediately. Each party shall retain a signed copy of the Daily Extra Work Report. Daily Extra Work Reports by Subcontractors or others shall be submitted through the Contractor.

The Daily Extra Work Report shall:

1) Show names of workers, classifications, and hours worked.
2) Describe and list quantities of materials used.
3) Show type of equipment, size, identification number, and hours of operation, including loading and transportation, if applicable.
4) Describe other services and expenditures in such detail as the Agency may require.

In addition to the Daily Extra Work Reports, the Contractor shall furnish Certified Payroll Records for the labor included in the reports before payment will be made.

3-4 CHANGED CONDITIONS. The Contractor shall notify the Engineer in writing of the following work site conditions, hereinafter called changed conditions, promptly upon their discovery and before they are disturbed:

1) Subsurface or latent physical conditions differing materially from those represented in the Contract;
2) Unknown physical conditions of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in Work of the character being performed; and
3) Material differing from that represented in the Contract which the Contractor believes may be hazardous waste, as defined in Section 25117 of the Health and Safety Code that is required to be removed to a Class I, Class II or Class III disposal site in accordance with provisions of existing law.

The Engineer will promptly investigate conditions which appear to be changed conditions. If the Engineer determines that the conditions are changed conditions and that they will materially increase or decrease the costs of any portion of the Work, a Change Order will be issued adjusting the compensation for such portion of the Work in accordance with 3-2.2. If the Engineer determines that conditions are changed conditions and that they will materially affect the performance time, the Contractor, upon submitting a written request, will be granted an extension of time subject to the provisions of 6-6.

If the Engineer determines that the conditions of which it has been notified by the Contractor do not justify an adjustment in compensation, the Contractor will be so notified in writing. This notice will also advise the Contractor of its obligation to notify the Engineer, in writing, if the Contractor disagrees.

Should the Contractor disagree with such determination, it may submit a written notice of potential claim to the Engineer before commencing the disputed work. In the event of such a disagreement, the Contractor shall not be excused on account of that disagreement from any scheduled completion date provided for by the Contract, but shall proceed with all Work to be performed under the Contract. However, the Contractor shall retain any and all rights provided either by Contract or by law which pertain to the resolution of disputes and protests between the contracting parties. The Contractor shall proceed as provided in 3-5.

The Contractor's failure to give notice of changed conditions promptly upon their discovery and before they are disturbed shall constitute a waiver of all claims in connection therewith.

3-5 DISPUTED WORK. If the Contractor and the Agency are unable to reach agreement on disputed work, the Agency may direct the Contractor to proceed with the Work. Payment shall be as later determined by mediation or arbitration, if the Agency and the Contractor agree thereto, or as fixed in a court of law.

Although not to be construed as proceeding under Extra Work provisions, the Contractor shall keep and furnish records of disputed work in accordance with 3-3.

SECTION 4 - CONTROL OF MATERIALS

4-1 MATERIALS AND WORKMANSHIP

4-1.1 General. All materials, parts, and equipment furnished by the Contractor in the Work shall be new, high grade, and free from defects. Quality of work shall be in accordance with the generally accepted standards. Material and work quality shall be subject to the Engineer's approval.

Materials and work quality not conforming to the requirements of the Specifications shall be considered defective and will be subject to rejection. Defective work or material, whether in place or not, shall be removed immediately from the site by the Contractor, at its expense, when so directed by the Engineer.

If the Contractor fails to replace any defective or damaged work or material after reasonable notice, the Engineer may cause such work or materials to be replaced. The replacement expense will be deducted from the amount to be paid to the Contractor.

Used or secondhand materials, parts, and equipment may be used only if permitted by the Specifications.

4-1.1.1 Materials Furnished by Agency. Materials furnished by the Agency will be available at locations designated in the Special Provisions or if not designated in the Special Provisions, they will be delivered to a single location of Agency's choice within the project area. They shall be hauled to the site of installation by the Contractor at its expense, including any necessary loading and unloading that may be involved. The cost of handling and placing materials furnished by the Agency shall be considered as included in the price paid for the Contract item involving such furnished materials.

The Contractor will be held responsible for all materials furnished to it, and it shall pay all demurrage and storage charges. Furnished materials, after delivery to Contractor, lost or damaged from any cause whatsoever shall be replaced by the Contractor. The Contractor will be liable to the Agency for the cost of replacing lost or damaged furnished material and such costs may be deducted from any monies due or to become due the Contractor.

4-1.2 Protection of Work and Materials. The Contractor shall provide and maintain storage facilities and employ such measures as will preserve the specified quality and fitness of materials to be used in the Work. Stored materials shall be reasonably accessible for inspection. The Contractor shall also adequately protect new and existing work and all items of equipment for the duration of the Contract.

The Contractor shall not, without the Agency's consent, assign, sell, mortgage, hypothecate, or remove equipment or materials which have been installed or delivered and which may be necessary for the completion of the Contract.

4-1.3 Inspection Requirements

4-1.3.1 General. Unless otherwise specified, inspection is required at the source for asphalt concrete pavement mixtures, structural concrete, metal fabrication, metal casting, welding, concrete pipe manufacture, protective coating application, and similar shop or plant operations. Steel pipe in sizes less than 450 mm (18 inches), vitrified clay and cast iron pipe in all sizes are acceptable upon certification as to compliance with the Specifications, subject to sampling and testing by the Agency. Standard items of equipment such as electric motors, conveyors, elevators, plumbing fixtures, etc., are subject to inspection at the Work site only. Special items of equipment such as designed electrical panel boards, large pumps, sewage plant equipment, etc., are subject to inspection at the source, normally only for performance testing. The Specifications may require inspection at the source for other items not typical of those listed in this section.

4-1.3.2 Inspection of Materials Not Locally Produced. When the Contractor intends to purchase materials, fabricated products, or equipment from sources located more than 80 km (50 miles) outside the geographical limits of the Agency, an inspector or accredited testing laboratory (approved by the Engineer), shall be engaged by the Contractor at its expense, to inspect the materials, equipment or process. This approval shall be obtained before producing any material or equipment. The inspector or representative of the testing laboratory shall evaluate the materials for conformance with the Plans and Specifications. The Contractor shall forward reports required by the Engineer. No materials or equipment shall be shipped nor shall any processing, fabrication or treatment of such materials be done without proper inspection by the approved agent. Approval by said agent shall not relieve the Contractor of responsibility for complying with the Contract requirements.

4-1.3.3 Inspection by the Agency. The Agency will provide all inspection and testing laboratory services within 80 km (50 miles) of the geographical limits of the Agency.

4-1.3.4 Certificates of Compliance. The Engineer may require certificates of compliance with the Specifications for materials or manufactured items produced outside of the Work site. Such certificates will not relieve the Contractor from the requirements of providing material and manufactured items complying with the Specifications even though they have been incorporated into the Work.

4-1.4 Tests of Materials. Before incorporation in the Work, the Contractor shall submit samples of materials, as the Engineer may require, at no cost to the Agency. The Contractor, at its own expense, shall deliver the materials for testing to the place and at the time designated by the Engineer. Unless otherwise provided, all initial testing and a reasonable amount of retesting shall be performed under the direction of the Engineer, and at no expense to the Contractor. If the Contractor is to provide and pay for testing, the Specifications will so state.

The Contractor shall notify the Engineer in writing, at least 15 Days in advance, of its intention to use materials for which tests are specified, to allow sufficient time to perform the tests. The notice shall name the proposed supplier and source of material.

If the notice of intent to use is sent before the materials are available for testing or inspection, or is sent so far in advance that the materials on hand at the time will not last but will be replaced by a new lot prior to use on the Work, it will be the Contractor's responsibility to re-notify the Engineer when samples which are representative may be obtained.

4-1.5 Certification. The Engineer may waive materials testing requirements of the Specifications and accept the manufacturer's written certification that the materials to be supplied meet those requirements. Materials test data may be required as part of the certification.

4-1.6 Trade Names or Equals. The Contractor may supply any of the materials specified or offer an equivalent. The Engineer shall determine whether the material offered is equivalent to that specified. Adequate time shall be allowed for the Engineer to make this determination.

Whenever any particular material, process, or equipment is indicated by patent, proprietary or brand name, or by name of manufacturer, such wording is used for the purpose of facilitating its description and shall be deemed to be followed by the words **or equal**. A listing of materials is not intended to be comprehensive, or in order of preference. The Contractor may offer any material, process, or equipment considered to be equivalent to that indicated. The substantiation of offers shall be submitted as provided in the Contract Documents.

The Contractor shall, at its expense, furnish data concerning items offered by it as equivalent to those specified. The Contractor shall have the material tested as required by the Engineer to determine that the quality, strength, physical, chemical, or other characteristics, including durability, finish, efficiency, dimensions, service, and suitability are such that the item will fulfill its intended function.

Test methods shall be subject to the approval of the Engineer. Test results shall be reported promptly to the Engineer, who will evaluate the results and determine if the substitute item is equivalent. The Engineer’s findings shall be final. Installation and use of a substitute item shall not be made until approved by the Engineer.

If a substitute offered by the Contractor is not found to be equal to the specified material, the Contractor shall furnish and install the specified material.

The specified Contract completion time shall not be affected by any circumstance developing from the provisions of this section.

4-1.6.1 Compatibility with Design. Where the size, configuration, weight, fastening locations, fastening strength, utility rough-in locations, and utility capacities of equipment or devices offered by the Contractor as equivalents do not conform to those provided for in the Contract Documents or those which are necessary for equipment or devices indicated by brand names, the Contractor shall bear all costs of redesign and changes in construction necessary to adapt the offered equipment or device to the Work.

Equipment or devices will not be considered "equal" where the life cycle cost of operation, utilities and maintenance of the offered alternate is greater than those listed by brand names. Life cycle costs shall mean utility charges (demand and usage charges), maintenance, operating personnel and replacement (equipment, installation and down time expenses) all reduced to an average annual rate using the current interest rate earned on funds invested by the County Treasurer.

4-1.6.2 Trade Names Listed. Where the Agency has listed products by brand or trade name on the Plans or in the Specifications, or both, this shall not be construed as meaning every product may be used without furnishing shop drawings, without redesign of the facility or without a change in utility rough-in requirements.

Where use of products listed on the Plans or in the Specifications, or both, or where use of a substitute proposed as an "equal" product requires shop drawings, redesign of the facility, or revisions in the size and location of rough-in utility connections, or in connecting work, the Contractor shall provide any necessary shop drawings, or shall cause the preparation of any necessary redesign or revisions to the Plans at its own expense and shall bear the full cost of any necessary additional construction or reconstruction work. No work described in shop drawings, a redesign, or a revision to the Plans shall be undertaken until such shop drawings, redesign, or revisions have been approved by the Engineer. Any proposed redesign or revision to the Plans shall be accompanied by complete computations and details prepared by an appropriate licensed design professional.

4-1.7 Weighing Equipment. All scales used for proportioning materials shall be inspected for accuracy and certified within the past 12 months by the State of California Bureau of Weights and Measures, by the County Director or Sealer of Weights and Measures, or by a scale mechanic registered with or licensed by the County.

The accuracy of the work of a scale service agency, except as stated herein, shall meet the standards of the California Business and Professions Code and the California Code of Regulations pertaining to weighing devices. A certificate of compliance shall be presented, prior to operation, to the Engineer for approval and shall be renewed whenever required by the Engineer at no cost to the Agency.

All scales shall be arranged so they may be read easily from the operator's platform or area. They shall indicate the true net weight without the application of any factor. The figures of the scales shall be clearly legible. Scales shall be accurate to within 1 percent when tested with the plant shut down. Weighing equipment shall be so insulated against vibration or moving of other operating equipment in the plant area that the error in weighing with the entire plant running will not exceed 2 percent for any setting nor 1.5 percent for any batch.

4-1.8 Calibration of Testing Equipment. Testing equipment, such as, but not limited to, pressure gages, metering devices, hydraulic systems, force (load) measuring instruments, and strain-measuring devices shall be calibrated by a testing agency acceptable to the Engineer at intervals not to exceed 12 months and following repairs, modification, or relocation of the equipment. Calibration certificates shall be provided when requested by the Engineer.

SECTION 5 - UTILITIES

5-1 LOCATION. The Permittee (in the case of Private Contracts) and the Agency (in the case of Cash or Assessment Act Contracts), will search known substructure records and furnish the Contractor with copies of documents which describe the location of utility substructures, or will indicate on the Plans for the project those substructures (except for service connections) which may affect the Work. Information regarding removal, relocation, abandonment, or installation of new utilities will be furnished to prospective bidders.

Where underground main distribution conduits such as water, gas, sewer, electric power, telephone, or cable television are shown on the Plans, the Contractor shall assume that every property parcel will be served by a service connection for each type of utility.

As provided in Section 4216 of the California Government Code, at least 2 working days prior to commencing any excavation, the Contractor shall contact the regional notification center (Underground Service Alert of Southern California) and obtain an inquiry identification number.

The California Department of Transportation is not required by Section 4216 to become a member of the regional notification center. The Contractor shall contact it for location of its subsurface installations.

The Contractor shall determine the location and depth of all utilities, including service connections, which have been marked by the respective owners and which may affect or be affected by its operations. If no pay item is provided in the Contract for this work, full compensation for such work shall be considered as included in the prices bid for other items of work.

5-2 PROTECTION. The Contractor shall not interrupt the service function or disturb the support of any utility without authority from the owner or order from the Agency. All valves, switches, vaults, and meters shall be maintained readily accessible for emergency shutoff.

Where protection is required to ensure support of utilities located as shown on the Plans or in accordance with 5-1, the Contractor shall, unless otherwise provided, furnish and place the necessary protection at its expense.

Upon learning of the existence and location of any utility omitted from or shown incorrectly on the Plans, the Contractor shall immediately notify the Engineer in writing. When authorized by the Engineer, support or protection of the utility will be paid for as provided in 3-2.2.3 or 3-3.

The Contractor shall immediately notify the Engineer and the utility owner if any utility is disturbed or damaged. The Contractor shall bear the costs of repair or replacement of any utility damaged if located as noted in 5-1.

When placing concrete around or contiguous to any non-metallic utility installation, the Contractor shall at its expense:

1. Furnish and install a 50 mm (2 inch) cushion of expansion joint material or other similar resilient material; or
2. Provide a sleeve or other opening which will result in a 50 mm (2 inch) minimum-clear annular space between the concrete and the utility; or
3. Provide other acceptable means to prevent embedment in or bonding to the concrete.

Where concrete is used for backfill or for structures which would result in embedment, or partial embedment, of a metallic utility installation; or where the coating, bedding or other cathodic protection system is exposed or damaged by the Contractor's operations, the Contractor shall notify the Engineer and arrange to secure the advice of the affected utility owner regarding the procedures required to maintain or restore the integrity of the system.

5-3 REMOVAL. Unless otherwise specified, the Contractor shall remove all interfering portions of utilities shown on the Plans or indicated in the Bid documents as "abandoned" or "to be abandoned in place". Before starting removal operations, the Contractor shall ascertain from the Agency whether the abandonment is complete, and the costs involved in the removal and disposal shall be included in the Bid for the items of work necessitating such removals.

5-4 RELOCATION. When feasible, the owners responsible for utilities within the area affected by the Work will complete their necessary installations, relocations, repairs, or replacements before commencement of work by the Contractor. When the Plans or Specifications indicate that a utility installation is to be relocated, altered, or constructed by others, the Agency will conduct all negotiations with the owners and work will be done at no cost to the Contractor, except as provided in 301-1.6. Utilities which are relocated in order to avoid interference shall be protected in their position and the cost of such protection shall be included in the Bid for the items of work necessitating such relocation.

After award of the Contract, portions of utilities which are found to interfere with the Work will be relocated, altered or reconstructed by the owners, or the Engineer may order changes in the Work to avoid interference. Such changes will be paid for in accordance with 3-2.

When the Plans or Specifications provide for the Contractor to alter, relocate, or reconstruct a utility, all costs for such work shall be included in the Bid for the items of work necessitating such work. Temporary or permanent relocation or alteration of utilities requested by the Contractor for its convenience shall be its responsibility and it shall make all arrangements and bear all costs.

The utility owner will relocate service connections as necessary within the limits of the Work or within temporary construction or slope easements. When directed by the Engineer, the Contractor shall arrange for the relocation of service connections as necessary between the meter and property line, or between a meter and the limits of temporary construction or slope easements. The relocation of such service connections will be paid for in accordance with provisions of 3-3. Payment will include the restoration of all existing improvements which may be affected thereby. The Contractor may agree with the owner of any utility to disconnect and reconnect interfering service connections. The Agency will not be involved in any such agreement.

5-5 DELAYS. The Contractor shall notify the Engineer of its construction schedule insofar as it affects the protection, removal, or relocation of utilities. Said notification shall be included as a part of the construction schedule required in 6-1. The Contractor shall notify the Engineer in writing of any subsequent changes in the construction schedule which will affect the time available for protection, removal, or relocation of utilities.

The Contractor will not be entitled to damages or additional payment for delays attributable to utility relocations or alterations if correctly located, noted, and completed in accordance with 5-1.

The Contractor may be given an extension of time for unforeseen delays attributable to unreasonably protracted interference by utilities in performing work correctly shown on the Plans.

The Agency will assume responsibility for the timely removal, relocation, or protection of existing main or trunkline utility facilities within the area affected by the Work if such utilities are not identified in the Contract Documents. The Contractor will not be assessed liquidated damages for any delay caused by failure of Agency to provide for the timely removal, relocation, or protection of such existing facilities.

If the Contractor sustains loss due to delays attributable to interferences, relocations, or alterations not covered by 5-1, which could not have been avoided by the judicious handling of forces, equipment, or plant, there shall be paid to the Contractor such amount as the Engineer may find to be fair and reasonable compensation for such part of the Contractor's actual loss as was unavoidable and the Contractor may be granted an extension of time.

5-5.1 Cooperation During Utility Relocation. When utilities are to be relocated during construction, the Contractor shall cooperate and coordinate with the respective utility owners so they may relocate their facilities to clear the Work. Delays in relocation of utilities which result from failure to cooperate and coordinate will not be a cause for an extension of time or Non-Working Days.

5-6 COOPERATION. When necessary, the Contractor shall so conduct its operations as to permit access to the Work site and provide time for utility work to be accomplished during the progress of the Work.

SECTION 6 - PROSECUTION, PROGRESS AND ACCEPTANCE OF WORK

6-1 CONSTRUCTION SCHEDULE AND COMMENCEMENT OF WORK. The requirements of this section concerning submission of construction schedules shall not apply to projects where the time allowed to complete the Work is less than 25 Working Days or the total Contract Price bid is less than $75,000 unless required by the special provisions.

The Contractor shall submit a construction schedule concurrently with the submittal of signed Contract, Contract bonds, and certificate of insurance. The Notice to Proceed will be delayed until the schedule is received. See 6-7.4, Starting of Contract Time.

When required by the Special Provisions, a revised schedule shall be submitted monthly prior to each progress payment closure date. Processing of the progress payment will be delayed until such revised schedule complying with this section is received.

The construction schedule shall be in the form of a Construction Element vs. Time Chart as shown in Appendix B-1and a Work Complete vs. Time Chart as shown in Appendix B-2.

The B-1 Chart shall be in sufficient detail to show the chronological relationship of all activities of the project including, but not limited to, estimated starting and completion dates of various activities, submittal of shop drawings to the Engineer for approval, procurement of materials, and scheduling of equipment. The B-1 Chart shall recognize the requirements of 5-5. The B-1 Chart shall reflect obtaining all materials and completing all Work under the Contract within the specified time and in accordance with these Specifications. If the Contractor intends to complete the Work prior to the time for completion, the intended date of completion shall be set forth in the B-1 Chart and the Contractor shall execute a Contract Change Order that changes the number of Working Days allowed for completion to conform with such intended completion date. The Change Order shall not change the Contract Price.

The Contractor may submit a computer generated schedule in lieu of the form in Appendix B-1 and B-2, provided all of the elements shown on that form or specified herein are included.

An updated construction schedule shall be submitted prior to the next progress payment closure date whenever the actual percent Work complete versus percent time elapsed curve falls below and to the right of the dotted line shown on Appendix B-2.

If the Contractor desires to make a major change in its method of operations after commencing construction, or if its schedule fails to reflect the actual progress, it shall submit to the Agency a revised construction schedule in advance of beginning revised operations.

Revised and updated schedules shall show actual completion to the date of the revision in the lower segmented bar for each item.

The construction schedule shall be prepared as follows (see examples in Appendices C-1 and C-2):

1. On theB-1 Chart:
   a. Enter the project name and Specification No. as shown on the notice inviting bids and the Contractors name.
   b. List the items of Work either individually or combined where items are part of the same element of the Work.
   c. Assign a value for each horizontal space plotting interval in Working Days as follows: 1 working day for total Contract time of less than 100 working days, 2 for 100 to 200 working days and 5 for longer projects. Enter the value used in the space provided in the lower part of the form.
   d. At the end of performance time and draw a vertical line and label it "End Performance Time". Enter numbers at 10 times the plotting interval at the top of intermediate vertical lines.
   e. Shade in a bar in the upper segmented section for each work item to indicate the period during which Work will be performed. Move-in time and delivery time for materials shall be shown if significant to the schedule.

6-1 CONSTRUCTION SCHEDULE AND COMMENCEMENT OF WORK. (Continued)

2. On the B-2 Chart:
   a. Enter the project name and Specification No. as shown on the notice inviting bids.
   b. At time intervals of 10 or 20 working days:
      (1) Compute the cumulative dollar value of Work which is expected to be completed for each item of Work, including the value of the completed portion of lump-sum items.
      (2) Divide the values computed in "b(1)" by the Total Contract Price to determine the percentage of the entire Contract planned for completion at the end of each time interval.
      (3) Divide the days of performance time at the end of each time interval by the total Contract performance time to obtain the percentage of elapsed performance time.
   c. Plot each percentage of completion value figure computed in "b(2)" against the corresponding percentage of completion time computed in "b(3)" using scales on the bottom and left side of chart.
   d. Connect points plotted in "c" with a line which will show the planned progress for the entire job.

If the proposed percent Work complete versus percent time elapsed line falls below and to the right of the dotted line drawn on the B-2 Chart, the Contractor shall provide sufficient information and backup to show that the Work can be completed on time.

6-1.1 Beginning of Work. The issuance of Notice to Proceed by Agency shall constitute the Contractor's authority to enter upon the site of the Work and to begin operations provided it has also notified Engineer at least 24 hours in advance. Entry upon the site without authority will be treated as trespassing.

6-1.2 Starting Work. The Contractor may start work at any time after the Notice to Proceed is issued but work shall begin within 15 Days after the starting date for the Contract, or at such other time as may be indicated in the Special Provisions. The actual date on which the Contractor starts work will not affect the required time for completion as provided for in 6-7 and 6-7.1.

6-1.3 Work Sequence. If required by the Special Provisions, the Contractor shall start construction operations on that part of the Work designated by the Engineer.

6-1.4 Resources Required. The Work shall be conducted in such a manner and with sufficient materials, equipment, and labor to insure its completion in accordance with the Plans and Specifications within the time set forth in the Contract.

6-2 PROSECUTION OF WORK. To minimize public inconvenience and possible hazard and to restore streets and other Work areas to their original condition and former state of usefulness as soon as practicable, the Contractor shall diligently prosecute the Work to completion. If, in the Engineer's opinion, the Contractor fails to prosecute the Work to the extent that the above purposes are not being accomplished, the Contractor shall, upon orders from the Engineer, immediately take the steps necessary to fully accomplish said purposes. All costs of prosecuting the Work as described herein shall be absorbed in the Contractor's bid. Should the Contractor fail to take the necessary steps to fully accomplish said purposes, after orders of the Engineer to do so, the Engineer may suspend the Work in whole or in part, until the Contractor takes said steps.

As soon as possible under the provisions of these Specifications, the Contractor shall backfill all excavations and restore to usefulness all improvements existing prior to the start of the Work.

If Work is suspended through no fault of the Agency, all expenses and losses incurred by the Contractor during such suspensions shall be borne by the Contractor. If the Contractor fails to properly provide for public safety, traffic, and protection of the Work during periods of suspension, the Agency may elect to do so, and deduct the cost thereof from monies due the Contractor. Such action will not relieve the Contractor from liability.

6-3 SUSPENSION OF WORK

6-3.1 General. The Work may be suspended in whole or in part when determined by the Engineer that the suspension is necessary in the interest of the Agency. The Contractor shall comply immediately with any written order of the Engineer. Such suspension shall be without liability to the Contractor on the part of the Agency except as otherwise specified in 6-6.3.

6-3.2 Archaeological and Paleontological Discoveries. If discovery is made of items of archaeological or paleontological interest, the Contractor shall immediately cease excavation in the area of discovery and shall not continue until ordered by the Engineer. When resumed, excavation operations within the area of discovery shall be as directed by the Engineer.

Discoveries which may be encountered may include, but not be limited to, dwelling sites, stone implements or other artifacts, animal bones, human bones and fossils.

The Contractor shall be entitled to an extension of time and compensation in accordance with the provisions of 6-6.

6-3.3 Temporary Suspension of Work. Should suspension of Work be ordered by reason of the failure of the Contractor to carry out orders or to perform any provisions of the Contract; or by reason of weather conditions being unsuitable for performing any item or items of Work; the Contractor, at its expense, shall do all the work necessary to provide a safe, smooth, and unobstructed passageway through construction for use by public traffic during the period of such suspension. In the event that the Contractor fails to perform the work above specified, the Agency may perform such work and the cost thereof will be deducted from monies due or to become due the Contractor.

If the Engineer orders a suspension of all of the Work, or a portion of the Work which is the current controlling operation or operations, due to unsuitable weather or to such other conditions as are considered unfavorable to the suitable prosecution of the Work, the days on which the suspension is in effect shall not be considered Working Days.

If a portion of Work at the time of such suspension is not a current controlling operation or operations, but subsequently does become the current controlling operation or operations, the determination of Working Days will be made on the basis of the then current controlling operation or operations.

If a suspension of Work is ordered by the Engineer due to the failure on the part of the Contractor to carry out orders given or to perform any provision of the Contract, the Days on which the suspension order is in effect shall be considered Working Days if such days are Working Days as defined.

6-4 TERMINATION OF THE CONTRACT FOR DEFAULT..

6.4.1 General. If, prior to the acceptance of the Work, the Contractor:

a) becomes insolvent, assigns its assets for the benefit of its creditors, is unable to pay its debts as they become due, or is otherwise financially unable to complete the Work,
b) abandons the Work by failing to report to the Work site and diligently prosecute the Work to completion,
c) disregards written instructions from the Agency or materially violates provisions of the Contract Documents,
d) fails to prosecute the Work according to the schedule approved by the Engineer,
e) disregards laws or regulations of any public body having jurisdiction, or
f) commits continuous or repeated violations of regulatory or statutory safety requirements, then the Agency will consider the Contractor in default of the Contract.

Notices, and other written communications regarding default between the Contractor, the Agency, and the Surety shall be transmitted in accordance with 2-12.

6-4.2 Notice to Cure. The Agency will issue a written notice to cure the default to the Contractor and its Surety. The Contractor shall commence satisfactory corrective actions within 5 Working Days after receipt.

6-4.3 Notice of Termination for Default. If the Contractor fails to commence satisfactory corrective action within 5 Working Days after receipt of the notice to cure, or to diligently continue satisfactory and timely correction of the default thereafter, then the Agency will consider the Contractor in default of the Contract and:

a) will terminate the Contractor's right to perform under the Contract by issuing a written notice of termination for default to the Contractor and its Surety,
b) may use any materials, equipment, tools or other facilities furnished by the Contractor to secure and maintain the Work site, and
c) may furnish labor, equipment, and materials the Agency deems necessary to secure and maintain the Work site. The provisions of this subsection shall be in addition to all other legal rights and remedies available to the Agency.

6-4.4 Responsibilities of the Surety. Upon receipt of the written notice of termination for default, the Surety shall immediately assume all rights, obligations and liabilities of the Contractor under the Contract. If the Surety fails to protect and maintain the Work site, the Agency may do so, and may recover all costs incurred. The Surety shall notify the Agency that it is assuming all rights, obligations and liabilities of the Contractor under the Contract and all money that is due, or would become due, to the Contractor shall be payable to the Surety as the Work progresses, subject to the terms of the Contract.

Within 15 Working Days of receipt of the written notice of termination for default, the Surety shall submit to the Agency a written plan detailing the course of action it intends to take to remedy the default. The Agency will review the plan and notify the Surety if the plan is satisfactory. If the Surety fails to submit a satisfactory plan, or if the Surety fails to maintain progress according to the plan accepted by the Agency, the Agency may, upon 48 hours written notice, exclude the Surety from the premises, take possession of all material and equipment, and complete the Work in any way the Agency deems to be expedient. The cost of completing the Work by the Agency shall be charged against the Surety and may be deducted from any monies due, or which would become due, the Surety. If the amounts due under the Contract are insufficient for completion, the Surety shall pay to the Agency, within 30 days after the Agency submits an invoice, all costs in excess of the remaining Contract Price.

6-4.5 Payment. The Surety will be paid for completion of the Work in accordance with 9-3 less the value of damages caused to the Agency by acts of the Contractor.

6-5 TERMINATION OF CONTRACT. The Board may terminate the Contract at its own discretion or when conditions encountered during the Work make it impossible or impracticable to proceed, or when the Agency is prevented from proceeding with the Contract by act of God, by law, or by official action of a public authority.
The Agency will issue a written notice of termination for convenience in accordance with 2-12. Upon receipt, the Contractor shall immediately cease work, except work the Contractor is directed to complete by the Engineer or required to complete for public safety and convenience. The Contractor shall immediately notify Subcontractors and suppliers to immediately cease their work.
The Contractor will be paid without duplication for:

a) work completed in accordance with the Contract Documents prior to the effective date of termination for convenience;
b) reasonable costs incurred in settlement of terminated contracts with Subcontractors, suppliers and others; and
c) reasonable expenses directly attributable to termination.
The Contractor shall submit a final termination settlement proposal to the Agency no later than 90 days from the effective date of termination, unless extended, in writing, by the Agency upon written request by the Contractor.

If the Contractor fails to submit a proposal, the Agency may determine the amount, if any, due the Contractor as a result of the termination. The Agency will pay the Contractor the amount it determines to be reasonable. If the Contractor disagrees with the amount determined by the Agency as being reasonable, the Contractor shall provide notice to the Agency within 30 days of receipt of payment. Any amount due shall be as later determined by arbitration, if the Agency and the Contractor agree thereto, or as fixed in a court of law.

6-6 DELAYS AND EXTENSIONS OF TIME

6-6.1 General. If delays are caused by unforeseen events beyond the control of the Contractor, such delays will entitle the Contractor to an extension of time as provided herein, but the Contractor will not be entitled to damages or additional payment due to such delays, except as provided in 6-6.3. Such unforeseen events may include war, government regulations, labor disputes, strikes, fires, floods, adverse weather necessitating cessation of work, other similar action of the elements, inability to obtain materials, equipment or labor, required Extra Work, or other specific events as may be further described in the Specifications.

No extension of time will be granted for a delay caused by the Contractor's inability to obtain materials unless the Contractor furnishes to the Engineer documentary proof of the inability to obtain such materials in a timely manner in accordance with the sequence of the Contractor's operations and the approved construction schedule.

If delays beyond the Contractor's control are caused by events other than those mentioned above, but substantially equal in gravity to those enumerated, and an extension of time is deemed by the Engineer to be in the best interests of the Agency, an extension of time may be granted, but the Contractor will not be entitled to damages or additional payment due to such delays, except as provided in 6-6.3.

If delays beyond the Contractor's control are caused solely by action or inaction by the Agency, such delays will entitle the Contractor to an extension of time as provided in 6-6.2.

6-6.2 Extensions of Time. Extensions of time, when granted, will be based upon the effect of delays to the Work as a whole and will not be granted for noncontrolling delays to minor included portions of Work unless it can be shown that such delays did, in fact, delay the progress of the Work as a whole.

6-6.3 Payment for Delays to Contractor. The Contractor will be compensated for damages incurred due to delays for which the Agency is responsible if such delays are unreasonable in the circumstances involved and were not within the contemplation of the parties when the Contract was awarded to the Contractor and delay the Work as a whole. Such actual costs will be determined by the Engineer. The Agency will not be liable for, and in making this determination the Engineer will exclude, all damages which the Engineer determines the Contractor could have avoided by any reasonable means including, without limitation, the judicious handling of forces, equipment, or plant.

6-6.4 Written Notice and Report. If the Contractor desires payment for a delay as specified in 6-6.3 or an extension of time, it shall, within 30 Days after the beginning of the delay, file with the Agency a written request and report as to the cause and extent of the delay. The request for payment or extension must be made at least 15 Days before the specified completion date. Failure by the Contractor to file these items within the time specified will be considered grounds for refusal by the Agency to consider such request.

6-6.4.1 Documentation of Delays. When the Contractor requests an extension of time for delay due to an inability to obtain materials or equipment, the documentary proof required by 6-6.1 shall include the following:

1. Date Engineer was notified of delay.
2. Date the delay began.
3. Exact description of material or equipment causing delay.
4. Documentation showing when and from whom ordered.
5. Documentation of promise to deliver.
6. Documentation of actual delivery date.
7. Description of how late delivery caused delay (include construction schedule).
8. Documentation of measures taken to get prompt delivery.
9. Documentation of attempts to get delivery from other sources.
10. Description of steps taken in project scheduling to minimize effects of late delivery.
11. Description of steps taken to get project back on schedule after actual delivery.
12. Statement of actual time lost as a result of late delivery.

6-7 TIME OF COMPLETION

6-7.1 General. The Contractor shall complete the Work within the time set forth in the Contract. The Contractor shall complete each portion of the Work within such time as set forth in the Contract for such portion. Unless otherwise specified, the time of completion of the Contract shall be expressed in Working Day

6-7.2 W orkinorkingg Day. A Working Day is any day within the period between the start of the Contract time as defined in 6-1 and the date provided in the Contract for completion or upon field acceptance by the Engineer of all Work provided for in the Contract, whichever occurs first, other than:

1. Saturday,
2. Sunday,
3. any day designated as a holiday by the Agency,
4. any other day designated as a holiday in a Master Labor Agreement entered into by the Contractor or on behalf of the Contractor as an eligible member of a Contractor Association,
5. any day the Contractor is prevented from working at the beginning of the workday for cause as defined in 6-6.1,
6. any day the Contractor is prevented from working during the first 5 hours of the workday with at least 60 percent of the normal work force for cause as defined in 6-6.1.

6-7.2.1 Holidays. Solely for the purposes of paragraph (3) of 6-7.2, the following days are designated as holidays by the Agency.

	A	B
MONTH	AGENCY EMPLOYEE HOLIDAYS	OTHER DESIGNATED HOLIDAYS
January	1st day; 3rd Monday	None
February	3rd Monday	12th day
March	None	31st day
March-April	None	1 Friday between March 21 & April 23 designated as Good Friday
May	Last Monday	None
June	None	None
July	4th day	None
August	None	None
September	1st Monday	9th day
October	None	2nd Monday
November	11th day; 4th Thursday	the Friday following the 4th Thursday
December	25th	23rd day, only if Thursday or Friday; 24th day; 31st day

If any day listed above falls on Saturday, the preceding Friday is the holiday. If any day listed above falls on Sunday, the succeeding Monday is the holiday.

No extra holiday shall result when such Friday or Monday is already designated as a holiday.
A copy of a Working Day calendar incorporating the above-listed holidays and used by the Agency for Contract time accounting purpose will be furnished to the Contractor upon request.

The term "holiday" as used in this section shall not be construed as being the same as "holiday" within the meaning of 7-2.2.

The Contractor may perform work on the holidays designated in Column A above provided it has obtained prior written approval of the Engineer at least two Days in advance of performing the work. The Contractor may perform work on the holidays designated in Column B above provided the Contractor notifies the Engineer two Days in advance of the holiday.

6-7.2.2 Landscape Maintenance Period. Where a landscape maintenance period is specified, the portion of the time in such period that follows the completion of all other Work required by the Contract shall not be Working Days for Contract time accounting.

6-7.3 Contract Time Accounting. The Engineer will make a daily determination of each Working Day to be charged against the Contract time. These determinations will be discussed and the Contractor will be furnished a periodic statement showing the allowable number of Working Days of Contract time, as adjusted, at the beginning of the reporting period. The statement will also indicate the number of Working Days charged during the reporting period and the number of Working Days of Contract time remaining. If the Contractor does not agree with the statement, the Contractor must file a written protest within 15 Days after receipt, setting forth the facts of the protest. Otherwise, the statement will be deemed to have been accepted.

6-7.4 Starting Date for Contract Time and Notice to Proceed. The starting date for Contract time accounting will be determined by adding the number of Days indicated on the Proposal form to the date the Contract is awarded, however the Agency may, at its option, delay the starting date by not more than 180 calendar Days if necessary to obtain grants, permits, rights-of-way, or approval of federal or State authorities, or when prevented from starting the project due to causes beyond its control. Notice to Proceed will be issued within 30 calendar Days after the Contract, bonds, certificates of insurance and other documents have been returned, properly completed by the Contractor, unless the starting date is delayed as herein provided. If the Agency delays the Contract starting date, Notice to Proceed will be issued at least 7 calendar Days prior to the new starting date. Any delay caused by failure of the Contractor to properly complete or timely return the Contract Documents shall not change the Contract starting date and shall not be a cause for extending the Contract time. The Notice of Award will indicate a probable Contract starting date. The Notice to Proceed will indicate the actual Contract starting date, computed as herein described.

6-8 COMPLETION, ACCEPTANCE AND WARRANTY.

6-8.1 Completion and Acceptance. Acknowledgment of completion of the Work will occur prior to Acceptance by the Agency. Acceptance will only occur after all Contract requirements have been fulfilled, such as training, submission of warranties, maintenance manuals, record drawings, Release on Contract and the like. Acceptance by the Agency will occur when the Engineer signs the Notice of Completion.

The Work will be inspected by the Engineer promptly upon receipt of the Contractor's written assertion that the Work has been completed. If, in the Engineer's judgment, the Work has been completed in accordance with the Plans and Specifications, the Engineer will acknowledge completion of the Work. Completion of the Work, as used above, shall include the Contractor showing evidence of having received an occupancy clearance from Building and Safety, or other permit issuing agency, when a building, plumbing electrical, grading, or other permit is required for the Work. The Engineer will, in acknowledging completion of the Work, set forth in writing the date when the Work was completed. This will be the date when the Contractor is relieved from responsibility to protect the Work. This will also be the date to which liquidated damages will be computed.

6-8.2 Warranty and Correction

6-8.2.1 Warranty The Contractor warrants to the Agency that materials and equipment furnished under the Contract will be new, unless otherwise specified in the Contract Documents, and of good quality, that the Work will be free from defects in materials and workmanship and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective by the Agency. This warranty excludes damage or defect caused by abuse (other than by the Contractor or those under the control of the Contractor), modifications not executed by the Contractor, or improper or insufficient maintenance. This warranty excludes normal wear and tear. Nothing in this warranty is intended to limit any manufacturer’s warranty which provides the Agency with greater warranty rights.

6-8.2.2 Correction Period For a period of one (1) year from the date of acceptance of the Work by the Agency, the Contractor shall repair or replace any defective workmanship or materials or Work not in conformance with the Contract Documents after notice to do so from the Engineer, and within the time specified in the notice. If the Contractor fails to make such repair or replacement within the time specified in the notice, the Agency may perform the repair or replacement and the Contractor and the Contractor’s sureties shall be liable for the cost thereof. The one (1) year period referenced in this section 6-8.2.2 applies only to the Contractor’s obligation to repair or replace defective workmanship or materials or Work not in conformance with the Contract Documents and is not intended to constitute a period of limitations for any other rights or remedies the Agency may have regarding the Contractor’s other obligations under the Contract Documents.

6-8.3 No Waiver of Legal Rights. The Agency shall not be precluded or estopped by any measurement, estimate, or certificate made either before or after the completion and Acceptance of the Work and payment therefor from showing the true amount and character of the Work performed and materials furnished by the Contractor, nor from showing that any such measurement, estimate, or certificate is untrue or is incorrectly made, nor that the Work or materials do not in fact conform to the Contract.

The Agency shall not be precluded or estopped, notwithstanding any such measurement, estimate, or certificate and payment in accordance therewith, from recovering from the Contractor or its sureties, or both, such damages as it may sustain by reason of the Contractor's failure to comply with the terms of the Contract.

Neither the Acceptance by the Engineer or by its representative, nor any payment for or Acceptance of the whole or any part of the Work, nor any extension of time, nor any possession taken by the Engineer shall operate as a waiver of any portion of the Contract or of any power herein reserved, or of any right to damages.

A waiver of any breach of the Contract shall not be held to be a waiver of any other or subsequent breach.

6-8.4 Landscape Maintenance Period. Final Acceptance of the Contract shall follow the satisfactory completion of all Contract Work, including the landscape maintenance period if one is specified.

6-8.5 Non-complying Work. Neither the final certificate of payment nor any provision in the Contract Documents, nor partial or entire occupancy of the premises by the Agency, shall constitute an Acceptance of Work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.

6-8.6 Written Warranties. The Contractor shall obtain and deliver to the Engineer all written warranties required to be furnished by the Specifications. Each of such warranty shall be underwritten by the Contractor for the full period prescribed therein, and shall bear its endorsement to such effect.

6-9 LIQUIDATED DAMAGES. Failure of the Contractor to complete the Work within the time allowed will result in damages being sustained by the Agency. Such damages are, and will continue to be, impracticable and extremely difficult to determine. For each consecutive calendar day in excess of the time specified, as adjusted in accordance with 6-6, for completion of the Work the Contractor shall pay to the Agency, or have withheld from monies due it, the sum of $250, unless otherwise provided in the Contract Documents.

Execution of the Contract under these Specifications shall constitute agreement by the Agency and Contractor that $250 per day is the minimum value of the costs and actual damage caused by failure of the Contractor to complete the Work within the allotted time, that such sum is liquidated damages and shall not be construed as a penalty, and that such sum may be deducted from payments due the Contractor if such delay occurs.

6-10 USE OF IMPROVEMENT DURING CONSTRUCTION. The Agency reserves the right to take over and utilize all or part of any completed facility or appurtenance. The Contractor will be notified in writing in advance of such action. Such action by the Agency will relieve the Contractor of responsibility for injury or damage to said completed portions of the improvement resulting from use by public traffic or from the action of the elements or from any other cause, except injury or damage resulting from the Contractor's operations or negligence. The Contractor will not be required to reclean such portions of the improvement before field completion, except for cleanup made necessary by its operations. Nothing in this section shall be construed as relieving the Contractor from full responsibility for correcting defective work or materials.

In the event the Agency exercises its right to place into service and utilize all or part of any completed facility or appurtenance, the Agency shall assume the responsibility and liability for injury to persons or property arising out of or resulting from the utilization of the facility or appurtenance so placed into service, except for any willful or negligent act or omission by the Contractor, Subcontractor, their officers, employees or agents.

6-10.1 Use of Improvements - Exceptions. The provisions of 6-10 shall not apply to projects for the repair, modification, enlargement or improvement of existing facilities that are to remain in use during construction except where a portion of the project which is completely independent from the rest of the Work can be completed and put into use by the Agency.

On projects on public roads, after satisfactory completion of an isolated section of the Work involving roadway improvements or repairs, when all temporary signs and other temporary Contractor facilities have been removed, the section is not being used as a detour, the section is no longer under the Contractor's control, and the section is opened to public traffic through the end of the Contract period, that section of the Work shall be taken over by the Agency as provided in 6-10. The Contractor shall indicate to the Engineer in writing when the conditions of this paragraph have been complied with and shall specify the limits of the section involved. Any taking over of the Work by the Agency shall be effective only when formal written notification is issued by the Agency.

6-11 NOTICE OF POTENTIAL CLAIM FOR ADDITIONAL COMPENSATION. Procedures for notice of claims in specific situations and circumstances are provided in the following sections:

3-4.....Changed Conditions
6-6.4.....Delay and Extensions of Time
6-7.3.....Contract Time Accounting

Compliance with this section is not prerequisite to assertion of a claim involving those sections or based on differences in measurements or errors of computation as to Contract quantities.

Compliance with the provisions of this section is required in all other situations and circumstances.

It is the intention of this section that differences arising between the parties under and by virtue of the Contract be brought to the attention of the Engineer at the earliest possible time in order that such matters may be settled, if possible, or other appropriate action taken to resolve such differences.

The Contractor shall give the Engineer written notice of a potential claim, setting forth: (1) the reasons for which the Contractor believes additional compensation will or may be due; (2) the nature of the costs involved; and (3) insofar as possible, the amount of the potential claim.

If the claim is based upon an act or failure to act by the Engineer, the said notice must be given to the Engineer prior to the date when the work giving rise to the potential claim is commenced; in all other cases the said notice must be given to the Engineer within 15 Days after the happening of the event, thing or occurrence giving rise to the potential claim.

The Contractor shall not be entitled to the payment of any additional compensation where the written notice of potential claim has not been given to the Engineer in the manner required by and within the time limitations of this section.

6-12 DISPUTES AND CLAIMS; PROCEDURE.

6-12.1 GENERAL. Any and all decisions made on appeal pursuant to this section shall be in writing. Any "decision" purportedly made pursuant to this section which is not in writing shall not be binding upon the Agency and should not be relied upon by the Contractor.

Filing or giving the notices required under 3-4, 6-6.4, 6-7.3 and 6-11 is prerequisite to recovery under a Contractor's claim for additional compensation; nothing in this section shall excuse the Contractor from its duty to file or give the required notices, or from performing other duties required by the Contract Documents.

6-12.2 ADMINISTRATIVE REVIEW. Prior to proceeding under 6-12.3 or filing a Complaint in Arbitration, the Contractor shall exhaust its administrative remedies by submitting its claim for review and decision by the following Agency staff in the following sequence:

Project Manager, responsible for the project
Department Director (Public Works Agency), responsible for the project.
Director of the Public Works Agency (the Engineer)

If the Contractor disputes the Project Manager's decision on its claim, the Contractor shall submit the claim to the Department Director. If the Contractor disputes the Department Director's decision on its claim, the Contractor shall submit the claim to the Engineer. Agency staff decisions shall state the portion of the claim that is undisputed if any.

The Project Manager may elect to forward a claim submitted by the Contractor directly to the Department Director. The Project Manager must give the Contractor notice of that election and the Contractor may supplement its claim within 7 Days of such notice (unless the parties agree in writing to a different time) and its claim will be deemed submitted on the earlier of the day it supplements its claim, the day it states in writing that it will not supplement its claim or the daytime to supplement expires. The Department Director may forward a claim timely submitted by the Contractor directly to the Engineer instead of making a decision on the claim, in which case no notice or opportunity to supplement the claim is required, and the claim shall be deemed timely submitted to the Engineer.

The Engineer's decision on the claim shall be the Agency's final decision.

Claims submitted to the Department Director and the Engineer shall be submitted in writing and shall include:

a. A copy of the disputed decision.
b. A statement as to why the Contractor believes the decision is in error.
c. All information, argument, documents and evidence (collectively, materials) that the Contractor wishes to have considered in the review. Where the request for review is made to the Engineer, in lieu of resubmitting materials which have already been submitted to the Department Director, the Contractor may include with the request a list of the materials the Contractor wants the Engineer to consider. Any additional materials and evidence not previously submitted to the Department Director shall be included with the request to the Engineer, if the Contractor wishes them to be considered. If relevant evidence is not available at the time the request is made to the Department Director or the Engineer, the Contractor shall identify such evidence and include a statement as to when such evidence will be submitted.

The Project Manager shall issue a decision on a claim within 10 Days of receipt; if the Project Manager does not do so, then the Project manager will be deemed to have decided to reject the claim in its entirety as of the conclusion of the 10th Day after receipt. The Contractor shall submit a claim to the Department Director for review and decision within 7 Days of receipt of the Project Manager's decision or of the time the Project Manager is deemed to have decided to reject the claim, whichever is applicable. The Department Director shall issue a decision on a claim within 10 Days of the timely submission of the claim; if the Department Director does not do so, then the Department Director will be deemed to have decided to reject the claim in its entirety as of the conclusion of the 10th Day after timely submission. The Contractor shall submit a claim to the Engineer for review and decision within 7 Days of receipt of the Department Director's decision or of the time the Department Director is deemed to have decided to reject the claim, whichever is applicable. If a claim is timely submitted to the Engineer and the Engineer fails to issue a decision on that claim within the time limits prescribed for issuing a written statement under Public Contract Code, section 9204, subdivision (d)(1), the Engineer shall be deemed to have decided to reject the claim in its entirety. At any time after the Project Manager receives a claim, the Agency and Contractor may agree in writing to different time limits than those set forth in this paragraph.

6-12.3 MEET AND CONFER; MEDIATION If the Contractor disputes the Agency's final decision, the Contractor may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the Agency shall schedule a meet and confer conference within 30 Days for settlement of the dispute.

Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the Agency shall provide the Contractor a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the claim shall be processed and made within 60 Days after the Agency issues its written statement. Any disputed portion of the claim, as identified by the Contractor in writing, shall be submitted to nonbinding mediation, with the Agency and the Contractor sharing the associated costs equally. The Agency and Contractor shall agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the Agency

and Contractor cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside this section.

For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.

Failure by the Agency to meet the time requirements of this section shall result in the portion of the claim that remains in dispute being deemed rejected in its entirety.

The parties may agree to waive, in writing, mediation under this section.

6-12.4 ARBITRATION. Claims and disputes arising under or related to the performance of the Contract, for which mediation under 6-12.3 was waived or unsuccessful except for claims which have been released by execution of the "Release on Contract" as provided in 9-4, shall be resolved by arbitration unless the Agency and the Contractor agree in writing, after the claim or dispute has arisen, to waive arbitration and to have the claim or dispute litigated in a court of competent jurisdiction. Arbitration shall be pursuant to Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2 of the Public Contract Code and the regulations promulgated thereto, Chapter 4 (commencing with Section 1300) of Division 2 of Title 1 of the California Code of Regulations. The arbitration decision shall be decided under and in accordance with California law, supported by substantial evidence and, in writing, contain the basis for the decision, findings of fact, and conclusions of law.

Arbitration shall be initiated by a Complaint in Arbitration made in compliance with the requirements of said Chapter 4. A Complaint in Arbitration by the Contractor shall be filed not later than 90 calendar Days after receipt of the final written decision of the Agency on the claim or dispute or within 300 Days after Acceptance of the Work by the Agency if no written decision has been issued. For the purposes of this section, "Acceptance of the Work by the Agency" shall be defined as the date the Notice of Completion is filed.

Where an election is made by either party to use the Simplified Claims Procedure provided under Sections 1340-1346 of said Chapter 4, the parties may mutually agree to waive representation by counsel.

All contracts valued at more than $25,000 between the Contractor and its subcontractors and suppliers shall include a provision that the subcontractors and suppliers shall be bound to the Contractor to the same extent that the Contractor is bound to the Agency by all terms and provisions of the Contract, including this arbitration provision.

6-13 CONTRACTOR'S WORK HOURS

6-13.1 Working Hours Limitations. Except as otherwise specified, no work shall be performed by the Contractor at the Work site between the hours of 7:00 p.m. and 7:00 a.m. the following day, nor shall work be performed on Saturdays, Sundays or holidays listed in 6-7.2.1.

6-13.2 Regular Work Schedule. The Contractor shall furnish a work schedule with the Construction Schedule required by 6-1 and inform the Engineer at least two Days in advance of changing the schedule. The schedule shall include the times for starting and ending work on each day. Such starting and ending times shall not be more than 10 1/2 hours apart.

6-13.3 Exceptions. The limitations on working hours and days shall not apply to emergency work made necessary by unusual conditions where such work is necessary to protect the Work, to protect the property of others, to protect life, or to ensure the orderly flow of traffic.

The limitations of this section shall not apply where work at times other than allowed by 6-13.1 and 6-13.2 is necessary in order to make utility connections or is required by other provisions contained in these Specifications in order to perform the work in the manner specified. In these cases, the Contractor shall obtain prior written approval of the Engineer at least two Days in advance of performing the work.

SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR

7-1 THE CONTRACTOR'S EQUIPMENT AND FACILITIES.

7-1.1 General. The Contractor shall furnish and maintain in good condition all equipment and facilities as required for the proper execution and inspection of the Work.

The Contractor shall provide and maintain enclosed toilets for the use of employees engaged in the Work. These accommodations shall be maintained in a neat and sanitary condition, and regularly pumped out.

7-1.2 Temporary Utility Services. The Contractor shall, at its own expense, make all arrangements necessary for the provision of temporary utility services necessary for its own use during performance of the Work.

The Contractor shall not draw water from any fire hydrant (except to extinguish a fire), without obtaining permission from the water utility owner.

7-1.3 Crushing and Screening Operations. Unless otherwise specified in the Special Provisions, the establishment and operation of portable screens and crushers will not be allowed on or adjacent to the Work site.

7-2 LABOR

7-2.1 General. The Contractor, its agents, and employees shall be bound by and comply with applicable provisions of the Labor Code and Federal, State, and local laws related to labor.

Any worker found by the Engineer to be incompetent, intemperate, troublesome, disorderly, or otherwise objectionable, or who fails to perform the Work properly and acceptably, shall be immediately removed from the Work site by the Contractor and shall not be reemployed in the performance on the Work.

7-2.1.1 Special Qualifications. Where the Engineer determines certain portions of the Work require experience, training, certification or other special qualifications that may not be possessed by the average journeyperson, such portions of the Work will be specifically identified in the Special Provisions and the special qualifications identified.

When work requiring special qualifications is being performed, a person with such qualifications must be in immediate charge of the work. The person may be a lead journeyperson, foreperson or trade superintendent. The general superintendent or a foreperson who is not specifically assigned to the area where the identified work is being performed will not be considered to be in immediate charge of the work.

Written certification of the required qualifications shall be furnished to the Engineer at least one week prior to the time work is commenced on the work requiring such qualifications. Such certification is subject to review and acceptance by the Engineer. If, during performance of work requiring special qualifications, the qualified person becomes temporarily or permanently unavailable to the Contractor, work shall not proceed until a qualified replacement has been accepted by the Engineer. The Engineer will promptly consider the certification of the replacement.

If identified work is performed without a person having the special qualifications in charge, the Engineer may, at its sole discretion, order such work removed and replaced at the Contractor's expense.

If, after certification is accepted, the Engineer finds that the certification was inaccurate, or work on the project indicates a lack of the knowledge and experience to supervise the work, the Engineer may order the work stopped until an acceptable replacement has been certified, accepted and is in charge.

7-2.2 Prevailing Wages. Pursuant to Section 1773.2 of the Labor Code, the current prevailing rate of per diem wages at the time of the Bid as determined by the Director of the Department of Industrial Relations (DIR) are on file at the office of the Engineer. The Contractor shall post a copy of these rates at the Work site. Pursuant to Section 1774 of the Labor Code, the Contractor and any Subcontractors shall pay not less than the specified prevailing rates of wages to workers employed on the Contract. If the Contract is Federally-funded, the Contractor and any Subcontractors shall not pay less than the higher of these rates or the rates determined by the United States Department of Labor. Pursuant to Section 1775 of the Labor Code, the Contractor and any Subcontractors, shall, as a penalty to the Agency, forfeit the prescribed amounts per calendar day, or portion thereof, for each worker paid less than the prevailing wage rates. The project is subject to the compliance monitoring and enforcement by the California Department of Industrial Relations (DIR). The contractor is responsible for posting job site notices as prescribed by regulation pursuant to Labor Code section 1771.4, subdivision (a)(2). The Contractor and each Subcontractor, if any, must be registered with the DIR pursuant to Labor Code section 1725.5 and section 1771.1. The Contractor and each Subcontractor, if any, must submit certified payrolls to the Labor Commissioner pursuant to Labor Code 1771.4.

7-2.2.1 Apprentices. Apprentices shall be employed on the Work in accordance with Labor Code Section 1777.5. The Contractor is responsible for compliance with Labor Code Section 1777.5 for all apprenticeable occupations whether employed directly or through subcontractors.

7-2.2.2 Contractors' Duties Concerning Labor Code Compliance. As required by Labor Code 1775(b)(1), Labor Code Sections 1771, 1775, 1776, 1777.5, 1813 and 1815 are required to be included in the contract between the Contractor and subcontractors. The Contractor agrees to comply with these sections and all remaining provisions of the Labor Code.

7-2.3 Payroll Records. Pursuant to Section 1776 of the Labor Code the Contractor and each Subcontractor, if any, shall keep, make available, and submit to the Engineer within ten (10) days of receipt of a written request,

certified payroll records. Pursuant to Labor Code section 1776, subsection (h), the Contractor and each Subcontractor, if any, shall, as a penalty to the Agency, forfeit the prescribed amount for each calendar day, or portion thereof, for each worker, the Contractor and each Subcontractor, if any, fails to comply with that subsection until strict compliance is effectuated. The Contractor and each Subcontractor, if any, waives any right to any notice or hearing on the forfeiture of such penalties pursuant to Labor Code sections 1726 or 1771.6. The contractor shall include the in its subcontracts as required to make this paragraph effective as to each Subcontractor. Upon written request, the Contractor shall withhold penalties forfeited by a Subcontractor pursuant to Labor Code section 1776,l subsection (h), and this paragraph from payment due to such Subcontractor and remit such penalties withheld to the Agency.

7-2.4 Hours of Labor. Pursuant to Section 1810 of the Labor Code, 8 hours of labor shall constitute a legal day's work. Pursuant to Section 1813 of the Labor Code, the Contractor and any Subcontractors, shall, as a penalty to the Agency, forfeit the prescribed amount per calendar day for each worker required or permitted to work more than 8 hours in any 1 calendar day and 40 hours in any 1 calendar week without being compensated in accordance with Section 1815.

Pursuant to Section 1810 of the Labor Code, 8 hours of labor shall constitute a legal day's work. Pursuant to Section 1813 of the Labor Code, the Contractor and each Subcontractor, if any, shall, as a penalty to the Agency, forfeit the prescribed amount per calendar day for each worker required or permitted to work more than 8 hours in any 1 calendar day and 40 hours in any 1 calendar week without being compensated in accordance with Section 1815. Contractor and each Subcontractor, if any, waives any right to any notice or hearing on the forfeiture of such penalties pursuant to Labor Code sections 1726 and 1771.6. Contractor shall include terms in its subcontracts as required to make this paragraph effective as to each Subcontractor. Upon written request, Contractor shall withhold penalties forfeited by a Subcontractor pursuant to Labor Code section 1813 and this paragraph from payments due to such Subcontractor and remit such penalties withheld to the Agency

7-3 INDEPENDENCE OF CONTRACTOR, INDEMNIFICATION AND POLLUTION

7-3.1 Independence of Contractor. It is understood and agreed that Contractor is at all times an independent contractor and that no relationship of employer-employee exists between the parties hereto.
Contractor will not be entitled to any benefits payable to employees of County, including but not limited to overtime, retirement benefits, workers' compensation benefits, injury leave or other leave benefits. County is not required to make any tax or benefit deductions from the compensation payable to Contractor under the provisions of this Agreement. As an independent contractor, Contractor hereby holds County harmless from any and all claims that may be made against County based upon any contention by any third party that an employer-employee relationship exists by reason of the Agreement.

If, in the performance of this Agreement, any third persons are employed by Contractor, such persons will be entirely and exclusively under the direction, supervision and control of Contractor. All terms of employment, including hours, wages, working conditions, discipline, hiring and discharging or any other terms of employment or requirements of law, will be determined by Contractor. County will have no right or authority over such persons or the terms of such employment, except as provided in this Agreement.

7-3.2 Indemnification and Hold Harmless Clause. All activities arising out of or relating to the performance of the Work covered by this Contract shall be at the risk of Contractor. To the fullest extent permitted by law, Contractor shall defend (at Agency's request), indemnify and hold harmless Agency, and the County of Ventura if the County of Ventura is not the entity defined as Agency under this Contract, including all of their boards, agencies, departments, officers, employees, agents and volunteers (collectively, "Indemnitee"), against any and all claims, suits, actions, legal or administrative proceedings, judgments, debts, demands, damages, including injury or death to any person or persons, and damage to any property including loss of use resulting therefrom, incidental and consequential damages, liabilities, interest, costs, attorneys' fees and expenses of whatsoever kind of nature, whether arising before, during or after commencement or completion of this Contract, whether against Contractor and Indemnitee or which are in any manner, directly, indirectly, in whole or in part, arising from any act, omission, fault or negligence, whether active or passive, of Contractor, a Subcontractor or anyone directly or indirectly employed by them or anyone for whose acts they may be liable in connection with or incident to the Contract, even though the same may have resulted from the joint, concurring or contributory negligence, or from the passive negligence, of Indemnitee or any other person or persons, unless the same be caused by the sole negligence of Indemnitee, or except to the extent caused by the active negligence or willful misconduct of Indemnitee.

The Agency will notify the Contractor of the receipt of any third-party claims.

7-3.3 Contamination and Pollution. Contractor, solely at its own cost and expense, will provide clean-up of any premises, property or natural resources contaminated or polluted due to Contractor activities. Any fines, penalties, punitive or exemplary damages assigned due to contaminating or polluting activities of the Contractor will be borne entirely by the Contractor.

7-3 INSURANCE REQUIREMENTS

Contractor, at its sole cost and expense, shall obtain and maintain in full force during the term of this Contract the following types of insurance:

7-4.1 Workers' Compensation Insurance.

7-4.1.1 Coverage. Workers' Compensation coverage, in full compliance with Labor Code 3700, for all employees of Contractor and Employer's Liability in the minimum amount of $1,000,000. The Agency, the County of Ventura, its officers, employees or Consultants, will not be responsible for any claims in law or equity occasioned by failure of Contractor to comply with this paragraph.

7-4.1.2 Certification. Before execution of the Contract by Agency, Contractor shall file with the Engineer the following signed certification:
"I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the Work of this Contract."

7-4.2 Commercial General Liability Insurance

7-4.2.1 Minimum Limits and Scope; Insurance Classes. "Occurrence" coverage in the minimum amount of:

Coverage Class	Coverage
L-A	$ 1,000,000 combined single limit (CSL) bodily injury and property damage each occurence and $1,000,000 aggregate
L-B	$ 1,000,000 CSL bodily injury and property damage each occurrence and $2,000,000 aggregate
L-C	$ 5,000,000 CSL bodily injury and property damage each occurrence and $5,000,000 aggregate
L-D	$ 10,000,000 CSL bodily injury and property damage each occurrence and $10,000,000 aggregate

If no coverage class is specified in "Proposal", coverage class L-B shall apply.
If Contractor maintains higher limits than the minimums shown above, the Agency requires and shall be entitled to coverage for the higher limits maintained by the Contractor. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the Agency.
Coverages shall include premises/operations; products/completed operations; independent contractors; underground, explosion and collapse hazards; personal and advertising injury; broad form property damage; and broad form blanket contractual.

7-4.2.2 Coverage Exceptions. On projects where no explosives will be used and no demolition is involved, the coverage for explosion may be omitted. On projects where no excavation is involved, the coverage for underground hazard may be omitted. The omission of said coverages is at Agency's option, and shall not abrogate Contractor's responsibilities for indemnification as set forth in these Specifications.

7-4.2.3 Excess Liability Policies. All Excess Liability policies, if used, shall be on an "umbrella" or following form of the primary layer of coverage.

7-4.3 Commercial Automobile Liability Insurance

Coverage in the minimum amount of $1,000,000 CSL bodily injury and property damage, including automobile liability, any auto.

7-4.4 Property Insurance

Contractor shall arrange for its own "Course of Construction" insurance on the project to protect its interests, as Agency does not have this coverage.
Contractor is responsible for delivering to Agency Work completed in accordance with the Contract except as provided in 7-18 (Acts of God). Should the Work being constructed be damaged by fire or other causes during construction, it shall be replaced by Contractor in accordance with the requirements of the Plans and Specifications without additional expense to Agency.

7-4.5 Other Insurance Provisions.

7-4.5.1 Insurance Company Qualifications. All insurance required shall be issued by (a) an admitted company or admitted companies authorized to transact business in the State of California which have a BEST rating of B+ or higher and a Financial Size Category (FSC) of VII or larger or (b) a California approved Surplus Line carrier or carriers which have a BEST rating of A or higher and a Financial Size Category (FSC) of VII or larger.
Workers compensation insurance not meeting the above requirements but meeting all other requirements of the specifications, will be accepted.

7-4.5.2 Primary Coverage. All insurance required shall be primary coverage as respects Agency and any insurance or self-insurance maintained by Agency or the County of Ventura shall be in excess of Contractor's insurance coverage and shall not contribute to it.

7-4.5.3 Aggregate Limits Exceeded. Agency shall not be notified immediately if any aggregate insurance limit is exceeded. Contractor shall purchase additional coverage to meet requirements.

7-4.5.4 Liability in Excess of Limits. Insurance coverage in the minimum amounts set forth herein shall not be construed to relieve Contractor for liability in excess of such coverage, nor shall it preclude Agency or the County of Ventura from taking such other actions as is available to it under any other provisions of this Contract or otherwise in law.

7-4.5.5 Additional Insured Endorsements. The Agency, the County of Ventura (if not defined as Agency) and all special Districts governed by the County of Ventura Board of Supervisors, and their officials, employees, and volunteers shall be named as Additional Insured as respects Work done by or on behalf of Contractor under the Contract on all policies required (except workers' compensation). With respect to Contractor's commercial general Liability insurance, Additional Insured coverage shall include both ongoing and completed operations.

7-4.5.6 Waiver of Subrogation Rights. Contractor agrees to waive all rights of subrogation against the Agency, the County of Ventura, including its boards, and all special Districts governed by the Board of Supervisors, for losses arising directly or indirectly from the activities or Work performed by Contractor under the Contract (applies only to Workers' Compensation and Commercial General Liability).

7-4.5.7 Cancellation Notice Required. In the case of policy cancellation, Agency shall be notified by the insurance company or companies as provided for in the policy. Contractor shall notify Agency of any and all policy cancellations within three working days of the cancellation.

7-4.5.8 Documentation Required. Prior to execution of the Contract by Agency, Contractor shall provide Agency with Certificates of Insurance for all required coverages (see Appendix A for example), all required endorsement(s) and a copy of its course of insurance policy.

It is the responsibility of Contractor to confirm that all terms and conditions of Section 7-4 Insurance Requirements are complied with by any and all subcontractors that Contractor may use in the completion of the Contract.

7-4 PERMITS. The Agency will obtain, at no cost to the Contractor, all encroachment and building permits necessary to perform Contract Work in streets, highways, railways or other rights of way, unless the necessity for such permit(s) is created by a method of operation chosen by the Contractor. The Contractor shall obtain and pay for all costs incurred for permits necessitated by its operations such as, but not limited to, those permits required for night Work, overload, blasting and demolition.

The Contractor shall pay all business taxes or license fees that are required for the Work.

7-5.1 Highway and Railroad Permits. The Engineer will obtain the basic State highway and railroad encroachment permits which will include checking of plans. However, the Contractor must also obtain permits from these agencies. Inspection fees charged by these agencies must be paid by the Contractor.

7-5.2 Grading Ordinance

7-5.2.1 General.

All excavation, filling and grading operations in Ventura County are governed by the Ventura County Grading Ordinance or City Ordinances, except within the project right of way shown on the Plans.

7-5.2.2 Permits Required. Work outside the project right of way which involves excavation or filling of soils is subject to all requirements of the applicable grading ordinance. The requirements may include, but are not limited to, submitting of a grading plan prepared by a Civil Engineer, obtaining a grading permit, paying the permit fee, posting a grading bond, hiring professionals for engineering and testing services, compacting fills, constructing drainage facilities and providing erosion protection.

7-5.2.3 Imported and Exported Material. To ensure that neither the Agency nor the Contractor is a party to aiding or abetting any property owner (who is ultimately responsible) to violate the applicable grading ordinance, no material shall be imported from or exported or wasted outside the project right of way until the Contractor has furnished the Engineer a copy of the grading permit covering such operation on land where material is to be deposited or excavated, unless exempt.

7-5.2.4 Exemptions from Permit. No grading permit is required of the Contractor for Work performed within the project right of way shown on the Plans or on borrow or disposal areas shown on the Plans or described in the Special Provisions and which are specifically designated as being exempt from such permit requirements.

7-5.3 Building Permit.

7-5.3.1 Agency Furnished Permits. Except as provided in **7-5.3.2**, Agency will submit the plans for the Work to Department of Building and Safety, and other building related permit issuing agencies, for plan check and make the corrections necessary for the issuance of building and related permits. Agency will Pay plan check and permit fees for the Work. The Contractor may be required to furnish information to the permit issuing agencies, as required for the issuance of permits, and sign the permit.

7-5.3.2 Contractor Furnished Permits. Components or systems, required by the Contract, may require the preparation of plans and calculations to obtain approvals or permits from state or local building, fire prevention, public health, safety, environmental protection and other agencies in addition to the basic permits arranged for by the Agency as provided in **7-5.3.1**. Contractor shall take all actions in a timely manner to obtain such approvals or permits so as not to delay completion of the Work beyond the time provided in **6-7**. Contractor shall include all costs and consider the time required to obtain approvals or permits in the Contract price bid.

7-5.4 Coastal Zone Permits

7-5.4.1 Agency Furnished Permits. Permits required for Work on the project within rights of way furnished by the Agency within the Coastal Zone will be obtained by the Agency.

7-5.4.2 Contractor Furnished Permits. Permits required for the Contractor's operations outside of rights of way furnished by the Agency must be obtained by the Contractor. Such permits are required for brush removal, grading, dredging, disposal of material and many other operations within the Coastal Zone.

7-5 THE CONTRACTOR'S REPRESENTATIVE. Before starting work, the Contractor shall designate in writing a representative who shall have complete authority to act for it. An alternative representative may be designated as well. The representative or alternate shall be present at the Work site whenever work is in progress or whenever actions of the elements necessitate its presence to take measures necessary to protect the Work, persons, or property. Any order or communication given to this representative shall be deemed delivered to the Contractor. A joint venture shall designate only one representative and alternate. In the absence of the Contractor or its representative, instructions or directions may be given by the Engineer to the superintendent or person in charge of the specific work to which the order applies. Such order shall be complied with promptly and referred to the Contractor or its representative.

In order to communicate with the Agency, the Contractor's representative, superintendent, or person in charge of specific work shall be able to speak, read, and write the English language.

7-6 COOPERATION AND COLLATERAL WORK. The Contractor shall be responsible for ascertaining the nature and extent of any simultaneous, collateral, and essential work by others. The Agency, its workers and contractors and others, shall have the right to operate within or adjacent to the Work site during the performance of such work.

The Agency, the Contractor, and each of such workers, contractors and others, shall coordinate their operations and cooperate to minimize interference.

The Contractor shall include in its Bid all costs involved as a result of coordinating its work with others. The Contractor will not be entitled to additional compensation from the Agency for damages resulting from such simultaneous, collateral, and essential work. If necessary to avoid or minimize such damage or delay, the Contractor shall redeploy its work force to other parts of the Work.

Should the Contractor be delayed by the Agency, and such delay could not have been reasonably foreseen or prevented by the Contractor, the Engineer will determine the extent of the delay, the effect on the Work, and any extension of time.

7-7 WORK SITE MAINTENANCE

7-8.1 General Throughout all phases of construction, including suspension of the Work, and until acceptance per 6-8, the Contractor shall keep the Work site clean and free from rubbish and debris. Rubbish and debris collected on the Work site shall only be stored in roll-off, enclosed containers prior to disposal. Stockpiles of such will not be allowed.

When required by the Special Provisions, the Contractor shall provide a self-loading motorized street sweeper equipped with a functional water spray system. The sweeper shall clean all paved areas within the Work site and all paved haul routes at least once each working day.

The Contractor shall ensure there is no spillage along haul routes. Any such spillage shall be removed immediately and the area cleaned.

Should the Contractor fail to keep the Work site free from rubbish and debris, the Engineer may suspend the Work per 6-3 until the condition is corrected.

7-8.2 Air Pollution Control. The Contractor shall not discharge smoke, dust, equipment exhaust, or any other air contaminants into the atmosphere in such quantity as will violate any Federal, State, or local regulations.

The Contractor shall also abate dust nuisance by cleaning, sweeping and spraying with water, or other means as necessary. The use of water shall conform to 7-8.6.

7-8.3 Noise Control. Noise generated from the Contractor's operations shall be controlled as specified in the Special Provisions.

7-8.4 Storage of Equipment and Materials.

7-8.4.1 General Materials and equipment shall be removed from the Work site as soon as they are no longer necessary. Before inspection by the Engineer for acceptance, the Work site shall be cleared of equipment, unused materials, and rubbish so as to present a satisfactory clean and neat appearance.

Excess excavated material shall be removed from the Work site immediately unless otherwise specified in the Special Provisions.

Forms and form lumber shall be removed from the Work site as soon as practicable after stripping.

7-8.4.2 Storage in Public Streets. Construction materials and equipment shall not be stored in streets, roads, or highways for more than 5 days after unloading unless otherwise specified in the Special Provisions or approved by the Engineer. All materials or equipment not installed or used in construction within 5 days after unloading shall be stored at a location approved by the Engineer.

Excavated material, except that which is to be used as backfill in the adjacent trench, shall not be stored in public streets unless otherwise specified in the Special Provisions or approved by the Engineer. Immediately after placing backfill, all excess material shall be removed from the Work site.

7-8.5 Sanitary Sewers.

7-8.5.1 General. The flow of sewage shall not be interrupted. Should the Contractor disrupt the operation of existing sanitary sewer facilities, or should disruption be necessary for performance of the Work, the Contractor shall bypass the sewage flow around the Work. Sewage shall be conveyed in closed conduits and disposed of in a sanitary sewer system. Sewage shall not be permitted to flow in trenches nor be covered by backfill.

Whenever sewage bypass and pumping is required by the Plans or Specifications, or the Contractor so elects to perform, the Contractor shall submit per 2-5.3 a working drawing conforming to 7-8.5.2 detailing its proposed plan of sewage bypass and pumping.

7-8.5.2 Sewage Bypass and Pumping Plan. The plan shall indicate the locations and capacities of all pumps, sumps, suction and discharge lines. Equipment and piping shall be sized to handle the peak flow of the section of sewer line to be bypassed and pumped. Equipment and piping shall conform to 7-10, the Plans, and the Special Provisions. Bypass piping, when crossing areas subject to traffic loads, shall be constructed in trenches with adequate cover and otherwise protected from damage due to traffic. Lay-flat hose or aluminum piping with an adequate casing and/or traffic plates may be allowed if so approved by the Engineer. Bypass pump suction and discharge lines that extend into manholes shall be rigid hose or hard pipe. Lay flat hose will not be allowed to extend into manholes. The Contractor shall provide a backup bypass pumping system in case of malfunction. The backup bypass system shall provide 100 percent standby capability, and be in place and ready for immediate use.
Each standby pump shall be a complete unit with its own suction and discharge piping. In addition to the backup system, the Contractor shall furnish and operate vacuum trucks when required by the Plans or Special Provisions.

7-8.5.3 Spill Prevention and Emergency Response Plan. The Contractor shall prepare and submit per 2-5.3 a spill prevention and emergency response plan. The plan shall address implementation of measures to prevent sewage spills, procedures for spill control and containment, notifications, emergency response, cleanup, and spill and damage reporting.

The plan shall account for all storm drain systems and water courses within the vicinity of the Work which could be affected by a sewage spill. Catch basins that could receive spilled sewage shall be identified Unless otherwise specified in the Special Provisions, these catch basins shall be sealed prior to operating the bypass and pumping system. The Contractor shall remove all material used to seal the catch basins when the bypass and pumping system operations are complete.

The Contractor shall be fully responsible for containing any sewage spillage, preventing any sewage from reaching a watercourse, recovery and legal disposal of any spilled sewage, any fines or penalties associated with the sewage spill imposed upon by the Agency and/or the Contractor by jurisdictional regulatory agencies, and any other expenses or liabilities related to the sewage spill.

7-8.6 Water and Pollution Control. The Contractor shall prevent, control, and abate discharges of pollutants from the construction site in order to protect the storm drain system, which includes pipes, channels, streams, waterways, and other bodies of water, by the construction, installation or performance of water pollution control measures as shown on the Stormwater Pollution Control Plan (SWPCP) or Stormwater Pollution Prevention Plan (SWPPP) depending on the land area affected by the construction activity. The Contractor shall ensure compliance with the current State NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activity (General Construction Permit), NPDES No. CAS000002 and current Ventura County NPDES Municipal Separate Storm Sewer System (MS4) Permit No. CAS004002.

7-8.6.1 Compliance with NPDES General Construction Permit 7-

8.6.1.1 Construction Sites

If the Work involves construction activity that results in soil disturbance of one acre or more of total land area, or results in soil disturbances of less than one acre but is a part of a work area larger than one acre, the Contractor shall comply with the requirements of the General Construction Permit NPDES No. CAS000002. Construction activity includes clearing, grading, excavation, stockpiling, and reconstruction of existing facilities involving removal and replacement. Construction activity does not include routine maintenance such as, maintenance of original line and grade, hydraulic capacity, or original purpose of the facility.

The Contractor shall comply with requirements of the General Construction Permit (NPDES No. CAS000002), obtained by the Agency, including a site-specific Storm Water Pollution Prevention Plan (SWPPP) for the Work to be developed by Qualified SWPPP Developer (QSD) and implemented by the Qualified SWPPP Practitioner (QSP). After July 1, 2010, the Agency will electronically file all required Permit Registration Documents (PRDs) through the State Water Board's Stormwater Multi-Application and Report Tracking System (SMARTS) website, as required prior to the commencement of construction activity. PRDs consist of the Notice of Intent (NOI), Risk Assessment, Post-Construction Calculations, a Site Map, the SWPPP, a signed certification statement by the Legally Responsible Party (LRP), and the first annual fee. For the Permit application, the Contractor shall submit to Project Manager the following:

- The completed site-specific Risk Assessment
- Post-construction calculations if applicable for the project, and
- Site-specific SWPPP developed in accordance with applicable Permits.

7-8.6.1.2 Linear Utility Projects; Contractor shall comply with the requirements of the General Construction Permit NPDES No. CAS000002 for Linear Underground/Overhead projects (LUPs) one acre or greater.

7-8.6.2 Compliance with NPDES MS4 Permit

7-8.6.2.1 Construction Sites Less Than One Acre The Contractor shall ensure implementation of an effective combination of erosion and sediment control Best Management Practices (BMPs) listed in **Table 6** of the Ventura County NPDES MS4 Permit. The Contractor shall develop and implement a Storm Water Pollution Control Plan (SWPCP).

7-8.6.2.2 Construction Sites One Acre but Less Than 5 Acres The Contractor shall ensure implementation of an effective combination of appropriate erosion and sediment control BMPs from **Table 7** (BMPs at Construction sites 1 acre or greater but less than 5 acres) of the Ventura County NPDES MS4 Permit in addition to the ones identified in **Table 6** (BMPs at Construction sites less than 1 acre) to prevent erosion and sediment loss, and the discharge of construction wastes. For all construction sites one acre or greater, the Contractor shall submit the SWPPP to the Agency for review and certification as the Local SWPPP.

7-8.6.2.3 Construction Sites 5 Acres and Greater The Contractor shall ensure implementation of an effective combination of the following BMPs in **Tables 8** (BMPs at Construction sites 5 acres or greater) in addition to the ones identified in **Table 6** (BMPs at Construction sites less than 1 acre) and **Table 7** (BMPs at Construction sites 1 acre or greater but less than 5 acres) at all construction sites 5 acres and greater to prevent erosion and sediment loss, and the discharge of construction wastes. For all construction sites one acre or greater, the Contractor shall submit the SWPPP to the Agency for review and certification as the Local SWPPP.

7-8.6.2.4 Enhanced Construction BMP Implementation

Construction sites located on hillsides, adjacent or directly discharging to CWA 303(d) listed waters for siltation or sediment, and directly adjacent to Environmentally Sensitive Areas are termed "high risk sites." Contractor shall implement enhanced practices that preclude impacts to water quality posed by the high risk sites.

Contractor shall ensure that high risk sites are inspected by the Qualified SWPPP Developer, Qualified SWPPP Practitioner, or Certified Professionals in Erosion and Sediment Control (CPESC) at the time of BMP installation, at least weekly during the wet season, and at least once each 24 hour period during a storm event that generates runoff from the site, to identify BMPs that need maintenance to operate effectively, that have failed or could fail to operate as intended.

During the wet season, the area of disturbance shall be limited to the area that can be controlled with an effective combination of erosion and sediment control BMPs. Enhanced sediment controls should be used in combination with erosion controls and should target portions of the site that cannot be effectively controlled by standard erosion controls described above. Effective sediment and erosion control BMPs proposed by the Contractor shall include the BMPs listed in Table 9 (Enhanced Construction BMP Implementation) of the NPDES MS4 Permit. The Contractor shall implement the BMPs listed in Table 9 unless shown unnecessary. Also, the Contractor shall retain records of the inspection and a determination and rationale of the BMPs selected to control runoff.

7-8.6.3 Plan.

7-8.6.3.1 The SWPCP, required for construction projects less than one acre, shall be prepared in accordance with the requirements of current Ventura County NPDES MS4 Permit No. CAS004002 and County Ordinance No. 4142.

7-8.6.3.2 The SWPPP, required for construction projects one acre or greater, shall be prepared in accordance with the requirements of the state's General Construction Permit NPDES Permit CAS000002, Ventura Countywide Stormwater Quality Management Program, NPDES MS4 Permit No. CAS004002, and County Ordinance No. 4142.

7-8.6.3.3 The SWPCP/SWPPP shall identify potential pollutant sources on the construction site that may affect the quality of discharges, whether non-stormwater or stormwater, from the site and design the use and placement of water pollution control measures, BMPs, to effectively prohibit the entry of pollutants from the site into the storm drain system during construction. At a minimum, and depending on the size of the project area, the SWPCP/SWPPP will include all appropriate minimum BMPs as required by the Ventura Countywide Stormwater Quality Management Program, NPDES MS4 Permit No. CAS004002 (Tables 6 through 9). The SWPCP/SWPPP must utilize the measures recommended in the California Stormwater Quality Association (CASQA) Stormwater BMPs Handbook for Construction (January 2003 version until July 1, 2010 and 2009 version after July 1, 2010). Starting July 1, 2010 SWPPP shall be prepared by QSD as defined in the NPDES Permit CAS000002. The Contractor shall complete, sign and submit the SWPCP/SWPPP for review and final approval by the Project Engineer, prior to issuance of the Notice to Proceed as provided in 6-7.4.

7-8.6.3.4 For all construction projects one acre and greater, the Contractor shall submit the SWPPP to the Agency for review and certification as Local SWPPP in accordance with NPDES MS4 Permit No. CAS004002 prior to the Notice to Proceed as provided in 6-7.4.

7-8.6.4 Measures. All water pollution control measures shall conform to the requirements of the submitted SWPCP/SWPPP. If circumstances during the course of construction require changes to the original SWPCP/SWPPP, a revised SWPCP/SWPPP shall be promptly submitted to the Project Manager in each instance. The SWPPP shall be amended or revised by QSD. A copy of the current SWPCP/SWPPP including revisions and amendments shall be kept at the site to ensure that field personnel has access to the current document at all times. If measures being taken are inadequate to control water pollution effectively, the Project Manager may direct the Contractor to revise the operations and no further work shall be performed until adequate water pollution control measures are implemented. Effective September 2, 2011, implementation of the SWPPP shall be overseen by the Contractor's QSP as defined in the General Construction Permit NPDES No. CAS000002. All work installed by the Contractor in connection with the SWPCP/SWPPP but not specified to become a permanent part of the Work shall be removed and the site restored in so far as practical to its original condition prior to completion of the Work.

7-8.6.4.1 Post-Construction Standards; Contractor shall ensure that applicable post-construction standards are implemented to meet applicable project requirements of the Ventura County NPDES MS4 Permit and General Construction Permit NPDES No. CAS000002 (effective September 2, 2012).

7-8.6.4.2 Active Treatment Systems; Contractor shall comply with requirements of the General Construction Permit NPDES No. CAS000002 for active treatment systems as applicable.

7-8.6.5 Monitoring and Reporting

7-8.6.5.1 Monitoring; In accordance with the General Construction Permit NPDES No. CAS000002, the Contractor shall develop and implement monitoring program for Risk Level 2 and 3 sites. In addition at Risk Level 3 sites, contractor shall perform receiving water monitoring to meet Permit requirements.

7-8.6.5.2 Reporting; the Contractor shall ensure that all submittals and reports are prepared and submitted to the RWQCB in accordance with the applicable Permits. At minimum the reports will include Annual Report (for applicable projects due September 1st), Rain Event Action Plan (due 48 hrs prior to the rain event for the applicable projects), Numeric Action Levels (NAL) Exceedance Report (as required), Numeric Effluent Limitations (NELs) Violation Report (within 24 hours after NEL exceedance is identified). Contractor shall submit required reports to the Project Manager for review and approval prior to submittal to the RWQCB.

7-8.6.6 Dewatering Activities. All dewatering activities shall be performed in accordance with applicable regulatory requirements issued by the Los Angeles Regional Water Quality Control Board, including specific requirements contained in the Waste Discharge Requirements (WDR) when issued for the Work.

7-8.6.7 Payment. The Contract lump sum price for water pollution control shall include full compensation for furnishing all labor, materials, tools, equipment, services and incidentals and for doing all work involved in water pollution control as specified herein. Payment for water pollution control will be made as the Work proceeds and is in compliance with the approved Water Pollution Control Plan, on the following basis.

Partial payment estimate (excluding mobilization & water pollution control payments) as a percentage of the original Contract price (excluding the mobilization & water pollution control Bid items).		Cumulative amount of water pollution control pay item earned is the lesser of the amounts as computed by these two columns.	
Equal to or greater than	Less than	Percentage of water pollution control pay item	Percentage of the original Contract total.
5	10	10	1
10	20	20	2
20	50	50	3
50	Completion of Work	75	5
Completion of Work		100	

Where no Bid item is provided for water pollution control, payment for water pollution control shall be considered to be included in the other Bid items.

7-8. Drainage Control. The Contractor shall maintain drainage within and through the Work areas. Earth dams will not be permitted in paved areas. Temporary dams of sandbags, asphaltic concrete or other acceptable material will be permitted when necessary to protect the Work, provided their use does not create a hazard or nuisance to the public. Such dams shall be removed from the site as soon as their use is no longer necessary.

7-8. Final Cleaning. At the completion of the Work, the Contractor shall remove all waste materials and rubbish from and about the project, as well as all tools, construction equipment, temporary facilities, machinery, and surplus materials.

At completion of construction and just prior to final inspection, the Contractor shall thoroughly clean the interior and exterior of the buildings, including hardware, floors, roofs, sills, ledges, glass, or other surfaces where debris, plaster, paint, spots, and dirt or dust may have collected. All glass shall be washed clean and polished. Remove all grease, stains, labels, fingerprints, and other foreign materials from interior and exterior surfaces. Repair, patch, and touch up marred surfaces to match adjacent finishes.

The Contractor shall use only experienced workmen or professional cleaners for final cleaning. It shall use only cleaning materials recommended by the manufacturer of the surface to be cleaned, and use cleaning materials only on surfaces recommended by the cleaning material manufacturer.

It shall broom-clean all paved surfaces and rake-clean other surfaces of grounds.

The Contractor shall replace air conditioning filters if units were operated during construction, and clean all ducts, blowers, and coils if air conditioning units were operated without filters during construction.

After cleaning, the Contractor shall maintain the building in a clean condition until it is accepted by the Agency.

7-9 PROTECTION AND RESTORATION OF EXISTING IMPROVEMENTS. The Contractor shall be responsible for the protection of public and private property adjacent to the Work and shall exercise due caution to avoid damage to such property.

The Contractor shall repair or replace all existing improvements within the right-of-way which are not designated for removal (e.g., curbs, sidewalks, driveways, fences, walls, signs, utility installations, pavement, structures, etc.) which are damaged or removed as a result of its operations. When a portion of a sprinkler system within the right-of-way must be removed, the remaining lines shall be capped. Repairs and replacements shall be at least equal to existing improvements and shall match them in finish and dimension.

Maintenance of street and traffic signal systems that are damaged, temporarily removed or relocated shall be done in conformance with 307-1.5.

Trees, lawns, and shrubbery that are not designated to be removed shall be protected from damage or injury. If damaged or removed because of the Contractor's operations, they shall be restored or replaced in as nearly the original condition and location as is reasonably possible. Lawns shall be reseeded and covered with suitable mulch.

The Contractor shall give reasonable notice to occupants or owners of adjacent property to permit them to salvage or relocate plants, trees, fences, sprinklers and other improvements which are designated for removal and would be destroyed because of the Work.

All costs to the Contractor for protecting, removing, and restoring existing improvements shall be absorbed in its bid.

In existing buildings, all surfaces, equipment, furniture and other property shall be protected from loss or damage by or as result of the Contractor's operations. The Contractor shall replace damaged property or shall repair and restore it to its previous condition. Patching, painting, replacement of wall, ceiling and floor covering and similar Work shall be done in such a manner that the repaired Work will not be readily noticeable.

7-1 PUBLIC CONVENIENCE AND SAFETY

7-10.1 Access.

7-10.1.1 General. The Contractor's operations shall cause no unnecessary inconvenience to the public or businesses in the vicinity of the Work. The Contractor shall have no greater length or quantity of Work under construction than can be properly prosecuted with a minimum of inconvenience to the public and other contractors engaged in adjacent or related work.

The Contractor shall provide continuous and unobstructed access to the adjacent properties unless otherwise specified in the Special Provisions or approved by Engineer. Work requiring traffic lane closures shall only be performed between the hours specified in the Special Provisions or shown on the TCP. Traffic shall be permitted to pass through the Work site, unless otherwise specified in the Special Provisions or shown on the TCP.

7-10.1.1.1 Vehicular Access. Vehicular access to residential driveways shall be maintained to the property line except when necessary construction precludes such access. If backfill has been completed to the extent that safe access may be provided and the street is opened to local traffic, the Contractor shall immediately clear the street and driveways and provide and maintain access.

7-10.1.1.2 Pedestrian Access. Safe, adequate, and ADA compliant pedestrian access shall be maintained unless otherwise approved by the Engineer. 7-10.2 Work Area Traffic Control.

7-10.2 Traffic Control

7-10.2.1 General. Work area traffic control shall conform to the California MUTCD, WATCH, or as specified in the Special Provisions. The total length of the traffic control zone shall include a buffer space, advance signing, striping transitions in advance of the Work site, existing striping, signing, and raised medians.

7-10.2.2 Traffic Control Plan.

7-10.2.2.1 General. If so specified in the Special Provisions or on the permit, the Contractor shall submit a TCP in accordance with 2-5.3. The sheets of the TCP shall display the title, phase identification, name of the firm preparing the TCP, name and stamp of the Registered Traffic or Civil Engineer, approval block for each jurisdictional agency, north arrow, sheet number, and number of sheets comprising the TCP. General notes and symbol definitions shall be included when required. Adequate dimensioning shall be provided to allow for proper field installation. The TCP shall be drawn to a 1 inch = 40 feet scale on common size sheets, either 8-1/2 inches x 11 inches, 8-112 inches x 14 inches, 11 inches x 17 inches, or 2-foot x 3-foot plan sheets as dictated by the length of the Work.

The requirements in the Special Provisions shall govern the design of the proposed TCP.

7-10.2.2.2 Payment. Payment for preparation of the TCP shall be included in the appropriate lump sum Bid items. If no Bid items have been provided, payment shall be included in the various Bid items unless otherwise specified in the Special Provisions.

7-10.3 Haul Routes. Unless otherwise specified in the Special Provisions, the haul route(s) shall be determined by the Contractor.

7-10.4 Safety.

7-10.4.1 Work Site Safety.

7-10.4.1.1 General. The Contractor shall provide safety measures as necessary to protect the public and workers within, or in the vicinity of, the Work site. The Contractor shall ensure that its operations will not create safety hazards. The Contractor shall provide safety equipment, material, and assistance to Agency personnel so that they may properly inspect all phases of the Work. When asbestos is being removed, the requirements of the CCR Title 8, Div. 1, Chapter 4, Subchapter 4 and Subchapter 7 shall be implemented.

7-10.4.1.2 Work Site Safety Official. The Contractor shall designate in writing a "Project Safety Official" who shall be at the Work site at all times, and who shall be thoroughly familiar with the Contractor's Injury and Illness Prevention Program (IIPP) and Code of Safe Practices (CSP). The Project Safety Official shall be available at all times to abate any potential safety hazards and shall have the authority and responsibility to shut down an unsafe operation, if necessary.

7-10.4.2 Safety Orders.

7-10.4.2.1 General. The Contractor shall have at the Work site, copies or suitable extracts of Construction Safety Orders, Tunnel Safety Orders, and General Industry Safety Orders issued by the State Division of Industrial Safety. Prior to beginning any excavation 5 feet in depth or greater, the Contractor shall submit to the Engineer, the name of the "Competent Person" as defined in CCR, Title 8, Section 1504, in accordance with 2-5.3. The "Competent Person" shall be present at the Work site as required by Cal-OSHA.

7-10.4.2.2 Shoring Plan. Before excavating any trench 5 feet (105m) or more in depth, the Contractor shall submit in accordance with 2-5.3 a detailed working drawing (shoring plan) showing the design of the shoring, bracing, sloping, or other provisions used for the workers' protection. If the shoring plan varies from the shoring system standards, the shoring plan shall be prepared by a registered Structural or Civil Engineer. The shoring plan shall accommodate existing underground utilities. No excavation shall start until the Engineer has accepted the shoring plan and the Contractor has obtained a permit from the State Division of Industrial Safety. A copy of the permit shall be submitted to the Engineer in accordance with 2-5.3. If the Contractor fails to submit a shoring plan or fails to comply with an accepted shoring plan, the Contractor shall suspend work at the affected location(s) when directed to do so by the Engineer. Such a directive shall not be the basis of a claim for Extra Work and the Contractor shall not receive additional compensation or Contract time due to the suspension.

7-10.4.2.3 Payment. Payment for shoring shall be included in the Bid item provided therefor. Payment for compliance with the provisions of the safety orders and all other laws, ordinances, and regulations shall be included in the various Bid items.

7-10.4.3 Use of Explosives. Explosives may be used only when authorized in writing by the Engineer, or as otherwise specified in the Special Provisions.
Explosives shall be handled, used, and stored in accordance with all applicable regulations. Prior to blasting, the

Contactor shall comply with the following requirements:

a) The jurisdictional law enforcement agency shall be notified 24 hours in advance of blasting.

b) The jurisdictional fire department shall be notified 24 hours in advance of blasting.

c) Blasting activities and schedule milestones shall be included in the Contractor's construction schedule per 6-1.

For a Private Contract, specific permission shall be obtained from the Agency in writing, prior to any blasting operations in addition to the above requirements.

The Engineer's approval of the use of explosives shall not relieve the Contractor from liability for claims caused by blasting operations.

7-10.4.4 Hazardous Substances. An MSDS as described in CCR, Title 8, Section 5194, shall be maintained at the Work site for all hazardous material used by the Contractor. Material usage shall be accomplished with strict adherence to California Division of Industrial Safety requirements and all manufacturer warnings and application instructions listed on the MSDS and on the product container label. The Contractor shall notify the Engineer if a specified product cannot be used under safe conditions. 7-10.4.5 Confined Spaces. 7-10.4.5.1 Confined Space Entry Program (CSEP). The Contractor shall be responsible for implementing, administering and maintaining a CSEP in accordance with CCR, Title 8, Sections 5156, 5157 and 5158.

Prior to the start of the Work, the Contractor shall prepare and submit a CSEP in accordance with 2-5.3. The CSEP shall address all potential physical and environmental hazards and contain procedures for safe entry into confined spaces such as the following:

a) Training of personnel
b) Purging and cleaning the space of materials and residue
c) Potential isolation and control of energy and material inflow
d) Controlled access to the space
e) Atmospheric testing of the space
f) Ventilation of the space
g) Special hazards consideration
h) Personal protective equipment
i) Rescue plan provisions

The submittal shall include the names of the Contractor's personnel, including each Subcontractor's personnel, assigned to the Work that will have CSEP responsibilities, their CSEP training, and their specific assignment and responsibility in carrying out the CSEP.

7-10.4.5 Confined Spaces.

7-10.4.5.1 Confined Space Entry Program (CSEP). The Contractor shall be responsible for implementing, administering and maintaining a CSEP in accordance with CCR, Title 8, Sections 5156, 5157 and 5158.
Prior to the start of the Work, the Contractor shall prepare and submit a CSEP in accordance with 2-5.3. The CSEP shall address all potential physical and environmental hazards and contain procedures for safe entry into confined spaces such as the following:

a) Training of personnel.
b) Purging and cleaning the space of materials and residue.
c) Potential isolation and control of energy and material inflow.
d) Controlled access to the space.
e) Atmospheric testing of the space.
f) Ventilation of the space.
g) Special hazards consideration.
h) Personal protective equipment.
i) Rescue plan provisions.

The submittal shall include the names of the Contractor's personnel, including each Subcontractor's personnel, assigned to the Work that will have CSEP responsibilities, their CSEP training, and their specific assignment and responsibility in carrying out the CSEP.

7-10.4.5.2 Permit-Required Confined Spaces. Entry into permit-required confined spaces as defined in CCR, Title 8, Section 5157 may be required as a part of the Work. Manholes, tanks, vaults, pipelines, excavations, or other enclosed or partially enclosed spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. The Contractor shall implement a permit-required CSEP prior to performing any work in a permit-required confined space. A copy of the permit shall be available at all times for review by the Contractor and the Engineer at the Work site.

7-10.4.5.3 Payment. Payment for the CSEP shall be included in the Bid items for which the CSEP is required.

7-10.5 Security and Protective Devices.

7-10.5.1 General. Security and protective devices shall consist of fencing, steel plates, or other devices as specified in the Special Provisions to protect open excavations

7-10.5.2 Security Fencing. The Contractor shall completely fence open excavations. Security fencing shall conform to 304-3.5. Security fencing shall remain in place unless workers are present and construction operations are in progress during which time the Contractor shall provide equivalent security.

7-10.5.3 Steel Plate Covers. The Contractor shall provide steel plate covers as necessary to protect from accidental entry into openings, trenches, and excavations.

7-8 PATENT FEES OR ROYALTIES. The Contractor shall absorb in its Bid, the patent fees or royalties on any patented article or process which may be furnished or used in the Work. The Contractor shall indemnify and hold the Agency harmless from any legal action that may be brought for infringement of patents.

7-8 ADVERTISING. The names of contractors, subcontractors, architects, or engineers, with their addresses and the designation of their particular specialties, may be displayed on removable signs. The size and location of such signs shall be subject to the Engineer's approval.

Commercial advertising matter shall not be attached or painted on the surfaces of buildings, fences, canopies, or barricades.

7-9 LAWS TO BE OBSERVED. The Contractor shall keep fully informed of State and National laws and County and Municipal ordinances and regulations which in any manner affect those employed in the Work or the materials used in the Work or in any way affect the conduct of the Work. It shall at all times observe and comply with all such laws, ordinances and regulations.

7-13.1 Mined Materials. Mined material from California surface mines, used on the Work, shall be from a mine identified in the list published by the California Department of Conservation (referred to as 3098 List), as required by Public Contract Code 20676. This list is available on the Internet at www.conservation.ca.gov/OMR/ab_3098_list/index.htm.

7-10 ANTITRUST CLAIMS. Section 7103.5 of the Public Contract Code provides:

"In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the contractor or subcontractor offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 [commencing with Section 16700] of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the contractor, without further acknowledgement by the parties."

7-11 RECYCLABLE CONSTRUCTION & DEMOLITION WASTES. Ventura County Ordinance Code Section, 4421 et seq, requires that if any recyclable solid wastes or marketable reusable materials will be generated on the site of the Work within the unincorporated areas of Ventura County, the Contractor shall prepare a Construction & Demolition Debris Waste Diversion Plan and submit it to the Ventura County Public Works Agency, Water & Sanitation Department - Integrated Waste Management Division (IWMD). The Contractor shall prepare and file Construction & Demolition Debris Waste Diversion Reporting Forms as required by the IWMD.

For projects within the unincorporated areas of Ventura County, the Contractor shall submit an IWMD Form B-Recycling Plan approved by IWMD prior to issuance of the Notice to Proceed as provided in 6-7.4.

For projects within the unincorporated areas of Ventura County, the Contractor shall submit an IWMD Form C-Reporting Form approved by IWMD prior to the Engineer preparing the final estimate as provided in 9-3.2.

If the site of the Work is within an incorporated city, the Contractor shall comply with all the recycling, solid waste diversion, and hauling requirements of that incorporated city.

7-12 BLANK

7-13 LOSS OR DAMAGE TO THE WORK. The Contractor is responsible for delivering to the Agency Work completed in accordance with the Contract except as provided in 7-18. Should the Work being constructed be damaged by fire or other causes before Acceptance by the Agency, it shall be replaced in accordance with the requirements of the Plans and Specifications without additional expense to the Agency. The Agency does not carry "Course of Construction" insurance on the Work. Contractor should arrange for its own insurance to protect its interests.

7-14 ACTS OF GOD. As provided in Section 7105 of the California Public Contract Code, the Contractor shall not be responsible for the cost of repairing or restoring damaged portions of the Work determined to have been proximately caused by an act of God in excess of 5 percent of the contracted amount, provided that the Work damaged was built in accordance with accepted and applicable building standards and the Specifications and Drawings. The Contractor shall obtain insurance to indemnify the Agency for any damage to the Work caused by an act of God if the premium of said insurance coverage is called for as a separate bid item in the bidding schedule for the Work. For purposes of this section, the term "acts of God" shall include only the following occurrences or conditions and effects: earthquakes in excess of a magnitude of 3.5 on the Richter Scale, and tidal waves.

SECTION 8 - FACILITIES FOR AGENCY PERSONNEL

8-1 GENERAL. A field office shall be provided when required by the Plans or Special Provisions. The field office shall be at a suitable location approved by the Engineer.

A field office shall be a weather-tight building of suitable proportions with 16 m^2 (120 sq. ft.) of floor area, at least one door, and a window area of 2 m^2 (22 Sq. Ft.). A field office may be a building or a separate room in a building the Contractor may be required to provide or that it may desire to provide for its own use. In either case, the room shall have a separate exterior door. All doors shall be provided with hasps for padlocks.

The office shall be convenient to the Work. It shall be adequately heated, ventilated, electrically lighted, and provided with telephone service, all at the expense of the Contractor or plant owner. Offices are for the exclusive use of Agency personnel, unless otherwise provided herein.

Field offices at the worksite shall be removed upon completion of the Work.

All costs incurred in furnishing, maintaining, servicing, and removing a field office required at the Work site shall be included in the price bid for such item. If such item is required by the Plans or Specifications and no bid item is provided in the Proposal, the costs shall be absorbed in the other items for which bids are entered. Buildings and equipment furnished by the Contractor at the Work site under the provisions of this section are the property of the Contractor.

The first progress payment will not be approved until all facilities are in place and fully comply with the Specifications.

8-2 EQUIPMENT FOR FIELD OFFICES. Unless otherwise specified, a field office shall be equipped with:

Plan table, 0.75 m x 1.5 m (2 1/2 ft. x 5 ft.) or larger
Plan rack, capacity to hold two sets of project Plans plus all shop drawings
Desk and chair
Two lockers with hasps for padlocks

SECTION 9 - MEASUREMENT AND PAYMENT

9-1 MEASUREMENT OF QUANTITIES FOR UNIT PRICE WORK

9-1.1 General. Unless otherwise specified, quantities of work shall be determined from measurements or dimensions in horizontal planes. However, linear quantities of pipe, piling, fencing, and timber shall be considered as being the true length measured along longitudinal axis.

Unless otherwise provided in Specifications, volumetric quantities shall be the product of the mean area of vertical or horizontal sections and the intervening horizontal or vertical dimension. The planimeter shall be considered an instrument of precision adapted to measurement of all areas.

9-1.2 Methods of Measurement. Materials and items of Work which are to be paid for on the basis of measurement shall be measured in accordance with the methods stipulated in the particular sections involved.

9-1.3 Certified Weights. When payment is to be made on the basis of weight, the weighing shall be done on certified platform scales or, when approved by the Engineer, on a completely automated weighing and recording system. The Contractor shall furnish the Engineer with duplicate licensed weighmaster's certificates showing actual net weights. The Agency will accept the certificate as evidence of weights delivered.

9-1.4 Units of Measurement. Measurements shall be in accordance with 1-4.1 and 1-4.2. A metric ton or “tonne” is equal to 1000 kilograms and the unit of liquid measure is a Liter (in U.S. Standard Measures, a pound is an avoirdupois pound; a ton is 2000 pounds avoirdupois; and the unit of liquid measure is a gallon).

9-2 LUMP SUM BID ITEMS. Items for which quantities are indicated as "Lump Sum", "L.S." or "Job" shall be paid for at the price indicated in the Proposal. Such payment shall be full compensation for the items of Work and all Work appurtenant thereto.

When required by the Specifications or requested by the Engineer, the Contractor shall submit to the Engineer within 15 Days after award of Contract, a detailed schedule in triplicate, to be used only as a basis for determining progress payments on a lump sum contract or any designated lump sum bid item. This schedule should equal in total the lump sum bid and shall be in such form and sufficiently detailed as to satisfy the Engineer that it correctly represents a reasonable apportionment of the lump sum. If Mobilization or Water Pollution Control are included in the detailed schedule, those items will be paid for as provided in 9-3.4.2 and 7-8.6.4, receptively.

9-3 PAYMENT

9-3.1 General. The quantities listed in the Bid schedule will not govern final payment unless identified by Agency on the Proposal as [F]. The symbol "[F]" indicates that the quantities shown on the Proposal form are the final pay quantities. Payment to the Contractor (except those items identified as [F]) will be made only for the actual quantities of Contract items constructed in accordance with the Plans and Specifications. Upon completion of construction, if the actual quantities show either an increase or decrease from the quantities given in the Bid schedule, the Contract Unit Prices will prevail subject to the provisions of 3-2.2.1. Payment for those items identified as [F] will be based on the quantities shown on the Proposal unless changed as provided in 3-2.2.1.

The unit and lump sum prices to be paid shall be full compensation for the items of work and all appurtenant work, including furnishing all materials, labor, equipment, tools and incidentals.

Payment for items shown on the Plans or required by the Specifications, for which no pay item is provided, shall be considered included in the prices named for the other items shown on the Proposal.

Payment will not be made for materials wasted or disposed of in a manner not called for under the Contract. This includes rejected material not unloaded from vehicles, material rejected after it has been placed and material placed outside of the Plan lines. No compensation will be allowed for disposing of rejected or excess material.

Whenever any portion of the Work is performed by the Agency at the Contractor's request, the cost thereof shall be charged against the Contractor, and may be deducted from any amount due or becoming due from the Agency.

Whenever immediate action is required to prevent injury, death, or property damage, and precautions which are the Contractor's responsibility have not been taken and are not reasonably expected to be taken, the Agency may, after reasonable attempt to notify the Contractor, cause such precautions to be taken and shall charge the cost thereof against the Contractor, or may deduct such cost from any amount due or becoming due from the Agency. Agency action or inaction under such circumstances shall not be construed as relieving the Contractor or its Surety from liability.

9-3.1 General. (Continued)

Payment shall not relieve the Contractor from its obligations under the Contract; nor shall such payment be construed to be Acceptance of any of the Work. Payment shall not be construed as the transfer of ownership of any equipment or materials to the Agency. Responsibility of ownership shall remain with the Contractor who shall be obligated to store, protect, repair, replace, rebuild, or otherwise restore any fully or partially completed work or structure for which payment has been made; or replace any materials or equipment required to be provided under the Contract which may be damaged, lost, stolen or otherwise degraded in any way prior to completion of the Work under the Contract, except as provided in 6-10.

Warranty periods shall not be affected by any payment but shall commence on the date equipment or material is placed into service at the written direction of the Engineer. In the event such items are not placed into service prior to partial or final completion of the Work, the warranty periods will commence on the date set forth as the date of field completion in the Engineer's acknowledgement of completion.

If, within the time fixed by law, a properly executed notice to stop payment is filed with the Agency, due to the Contractor's failure to pay for labor or materials used in the Work, all money due for such labor or materials will be withheld from payment to the Contractor in accordance with applicable laws.

At the expiration of 35 Days from the date of recording of the Notice of Completion, or as prescribed by law, the amount deducted from the final estimate and retained by the Agency will be paid to the Contractor except such amounts as are required by law to be withheld by properly executed and filed notices to stop payment, or as may be authorized by the Contract to be further retained.

9-3.2 Partial and Final Payment. The Engineer will, after award of Contract, establish a closure date for the purpose of making monthly progress payments. The Contractor may request in writing that such monthly closure date be changed. The Engineer may approve such request when it is compatible with the Agency's payment procedure.

Each month, the Engineer will make an approximate measurement of the Work performed to the closure date and, as a basis for making monthly payments, estimate its value based on the Contract Unit Prices or as provided for in 9-2. When the Work has been satisfactorily completed, the Engineer will determine the quantity of Work performed and prepare the final estimate.

Work not conforming to the Contract Documents shall not be measured for payment.

Conformance with the Contract Documents shall be, in addition to constructing the Work in accordance with the Contract Documents, the Contractor's compliance with those portions of the Contract Documents not directly related to the completed Work, including but not limited to: construction and maintenance of detours; diversion and control of water; protection and repair of existing facilities of the Agency and adjacent owners; site maintenance; coordination with utilities and other contractors on the site; proper survey procedures and records; obtaining required permits and inspections; complying with working hour limitations; providing a Contractor's representative while Work is being performed; complying with environmental requirements; maintaining access and safety for users of facilities that are to remain in service during construction; and obeying all laws affecting the Work.

Payment for Extra Work will be made only on approved Daily Extra Work Reports with supporting documentation as required in 3-3.

From each progress estimate, 5 percent will be deducted and retained by the Agency, and the remainder less the amount of all previous payment will be paid to the Contractor.

No progress payment made to the Contractor or its sureties will constitute a waiver of the liquidated damages under 6-9.

9-3.2 Partial and Final Payment. (Continued)

As provided for in Sections 22300 of the California Public Contract Code, the Contractor may substitute securities for any monies withheld by the Agency to ensure performance under the Contract. In substituting securities, the Contractor may either:

a. Deposit qualifying securities already owned by the Contractor with the Escrow prior to the Contract payment date, or

b. Direct the Agency to send retained funds to the Escrow to be invested by the Escrow in qualifying securities as directed by the Contractor.

9-3.2.1 Release of Withheld Contract Funds. Pursuant to Public Contract Code Section 22300, Contractor has the option to deposit securities with an Escrow Agent as a substitute for retention earnings required to be withheld by Agency pursuant to the construction Contract between the Agency and the Contractor. A form of Escrow Agreement for Security Deposits in Lieu of Retention has been adopted by the Agency as one of the Contract Documents; procedures for implementing the provisions of the Escrow Agreement are contained in Escrow Instructions which shall become effective upon exercise of the option by the Contractor.

The Contractor shall take the following steps if it desires to substitute securities:

a. Execute the Escrow Agreement for Security Deposits in Lieu of Retention.
b. Furnish to the Escrow Agent a power of attorney and other forms necessary to empower the Escrow Agent to convert the securities to cash.
c. Furnish to the Escrow Agent the securities described.
d. Pay the Escrow Agent's fees and costs.

When the Contractor deposits with the Escrow Agent securities in lieu of money required to be withheld from progress payments, a sum of money equivalent to the current cash value of the securities as determined by the Escrow Agent shall be released to the Contractor by, or upon the direction of, the Agency.

If the total of the money plus the current cash conversion value of securities on deposit should fall below the aggregate amount of the sums required to be withheld from progress payments pursuant to 9-3.1 and 9-3.2, an amount equal to the difference shall be withheld from the next regular progress payment in addition to the amount which would ordinarily be withheld pursuant to 9-3.1 and 9-3.2. If the next regular progress payment is less than the total of the amounts to be withheld therefrom, the Contractor shall immediately either deposit with the Agency cash in the amount of the difference or deposit with the Escrow Agent additional securities having a current cash conversion value equal to or greater than the difference.

The Contractor shall be the beneficial owner of any such securities on deposit with the Escrow Agency and shall be entitled to any interest earned thereon prior to conversion. The Agency may direct the Escrow Agency to convert securities with the Escrow Agency into cash, and to deliver the cash to the Agency, in any case where the Contractor is in default, including the following:

a. where the Agency would be entitled to use funds withheld pursuant to 9-3.1 and 9-3.2 to satisfy claims of workers, materials suppliers or subcontractors, or to complete or correct work which the Contractor has failed or refused to complete or correct, or

b. where the Contractor has failed to comply with the requirements of this section respecting the deposit of additional cash or securities to make up for a fall in the value of securities already on deposit with the Escrow Agency.

The Agency may hold and use cash resulting from such a conversion of securities in the same manner as it would be entitled to hold and use funds withheld pursuant to 9-3.1 and 9-3.2.

9-3.2.2 Timely Progress Payments. As required by Public Contract Code Section 20104.50, the Contractor is informed that should a progress payment not be made within 30 Days after receipt of an undisputed and properly submitted payment request from the Contractor, the Agency shall pay interest to the Contractor on the unpaid amount at the rate set forth in the Code of Civil Procedures, Section 685.010(a). Agency shall promptly review payment requests, and if not determined to be proper, document to the Contractor, within 7 Days, the reasons why the request is not proper.

Contractor should refer to the code sections cited for further information.

9-3.3 Delivered Materials. Payment for the cost of materials and equipment delivered to the Work site but not incorporated in the Work will be included in the progress estimate if, prior to the closure date for the monthly progress payment, the material or equipment is listed by the Contractor on the Agency's form together with date of delivery, vendor's or Subcontractor's name and cost; is accompanied by a copy of an invoice showing the cost thereof; has an aggregate cost in excess of $5,000 for each progress payment; is currently on the Work site at an approved location and in good condition; and is one of the following:

1. Precast concrete units weighing more than 100 kilograms (200 pounds) each.
2. Structural steel members weighing more than 100 kilograms (200 pounds) each.
3. Individual pieces of electrical equipment costing over $1,000 each.
4. Individual pieces of mechanical equipment costing over $1,000 each.
5. Reinforced concrete pipe of any size.
6. Storm drainage pipe 900 mm (36") in diameter and larger.
7. Water and sewer pipe 300 mm (12") in diameter and larger.
8. Finish hardware for doors.
9. Other individual items of equipment costing over $1,000 each
10. Materials where the aggregate value of a single type of material exceeds $1,000 and is either:
    a) Fabricated or cut to fit the Work before delivery, or
    b) Of a size or type not available from any manufacturer without a special production run.

On unit price Bid items, the amount paid for materials or equipment delivered but not incorporated in the Work shall not exceed 75% of the amount of the Bid item which includes such material or equipment.

On lump sum Bid items, the amount paid for materials and equipment delivered and not incorporated in the Work shall not exceed 75% of the item in the approved schedule submitted in accordance with 9-2 of which such materials or equipment is a part.

Should materials or equipment previously paid for be damaged, destroyed, stolen or removed from the Work site, the payment previously made therefor will be deducted from the next progress payment, unless such materials or equipment are replaced prior thereto.

On the closure date for progress payments, as provided in 9-3.2, the Contractor shall certify that all materials and equipment not incorporated into the Work, for which payment has previously been made or is being requested, is still at the Work site and in good condition. Failure to provide such certification will be cause for deducting previous payments for materials not incorporated in the Work from the amount due the Contractor in the progress payment.

Payment for materials or equipment, as provided herein, shall not constitute approval or acceptance thereof nor shall such payment modify or abridge any of the rights the Agency has under the Specifications or at law nor relieve the Surety of any of its obligations under the bonds.

9-3.4 Mobilization

9-3.4.1 Scope. Mobilization includes preliminary services, work and operations, including but not limited to, furnishing required bonds, obtaining necessary permits and work areas, providing a specified field office, the movement of labor, supplies, equipment and incidentals to the Work site, and for all other work, services and operations which must be performed or for which costs are incurred prior to performing work of the other Contract items.

9-3.4.2 Payment. The Contract lump sum price bid for mobilization shall include full compensation for furnishing all labor, materials, tools, equipment, services and incidentals and for doing all work involved in mobilization as specified herein. Payment for mobilization will be made as the Work proceeds on the following basis except that where a field office is required by the Specifications, no payment for mobilization will be made until the specified field office has been provided:

Partial payment estimate (excluding mobilization & water pollution control payments) as a percentage of the original Contract price (excluding the mobilization & water pollution control Bid items).		Cumulative amount of mobilization pay item earned is the lesser of the amounts as computed by these two columns.	
Equal to or greater than	Less than	Percentage of mobilization pay item	Percentage of the original Contract total.
5	10	50	5
10	20	75	7.5
20	50	95	9.5
50	Completion of Work	100	10
Completion of Work		100	

Where no Bid item is provided for mobilization, payment for mobilization shall be considered to be included in the other Bid items.

9-4 TERMINATION OF AGENCY LIABILITY. After completion of all work required by the contract, Agency will furnish Contractor a Release on Contract form stating the amount of total authorized payments for the project. Contractor shall execute and return said form within 21 days of receipt. Said form shall release and discharge the Agency from all claims of and liability to the Contractor for all manner of debts, demands, accounts, claims, and causes of action under or by virtue of said Contract except:

a. The claim against the Agency for the remainder, if any, of the amounts retained as provided in 9-3.2, and any amounts retained as required by Stop Notices or Labor Code provisions.

b. Any unsettled claims or disputes listed on the Release on Contract form which has been processed in compliance with the requirements for making claims under the Contract, including given timely notice pursuant to the applicable provisions of the Contract and following the procedure set forth in 6-12.

Acceptance of the Release on Contract by the Agency shall not be deemed a waiver or release of the Agency's right to contest either the substantive or procedural validity of any listed unsettled claims or disputes.

When executing the Release on Contract, the Contractor shall certify that each unsettled claim or dispute listed thereon has been processed in compliance with the requirements for making claims under the Contract, including giving timely notice pursuant to the applicable provisions of the Contract and following the procedures for resolution of disputes or claims set forth in 6-12 and that acceptance of the Release on Contract by the Agency shall not be deemed a waiver or release of the Agency's right to contest either the substantive or procedural validity of any listed unsettled claims or disputes.

If Contractor fails to execute and submit a Release on Contract within the 21-day time period set forth above, the Release on Contract shall be deemed to have been submitted with no unsettled claims or disputes listed on the Release on Contract. A payment of $1.00 will be made to the Contractor for such Release on Contract and waiver.

SECTION 10 - DIVERSION, CONTROL AND REMOVAL OF WATER

10-1 DESCRIPTION. This section covers the diversion, control and removal of all water entering into the construction area or otherwise affecting construction activities.

10-2 REQUIREMENTS. All permanent construction shall be performed in a site free from water unless otherwise provided for in the Special Provisions. The Contractor shall construct, maintain, and operate all necessary cofferdams, pumps, channels, flumes, drains, well points and/or other temporary diversion, protective, and water removal works required for diversion, control and removal of all water, whether surface or groundwater, whatever its source, during construction.

Inundation of partially completed Work due to lack of control during non-working periods will not be permitted, and may be cause for requiring removal and replacement of Work already completed.

The Contractor shall be responsible for obtaining the use of any property in addition to that provided for in the Plans and Specifications, which may be required for the diversion, protective, and water removal works so as not to create a hazard to persons or property or to interfere with the water rights of others.

It shall be understood and agreed that the Contractor shall hold the Agency and the Engineer harmless from legal action taken by any third party with respect to construction and operations of the diversion and protective works.

10-3 DIVERSION AND CONTROL WORKS.

Prior to beginning of work involving diversion, control and removal of water, the Contractor shall submit a water control plan to the Engineer. In the event circumstances during the course of construction require changes to the original water control plan, a revised water control plan shall be promptly submitted to the Engineer in each instance. No responsibility shall accrue to the Engineer or the Agency as a result of the plan or as a result of knowledge of the plan.

Construction and operation of the diversion, control and removal works shall be in accordance with the water control plan submitted, except deviations therefrom may be specifically approved by the Engineer.

All works installed by the Contractor in connection with dewatering, control, and diversion of water but not specified to become a permanent part of the Work, shall be removed and the site restored, insofar as practical, to its original condition prior to completion of construction or when directed by the Engineer.

10-4 PAYMENT. No separate Bid item is included. Payment for this item of Work will be considered to be included in the payments made for other items of Contract Work to which water control is incidental.

PART 2 CONSTRUCTION MATERIALS

SECTION 200 - ROCK MATERIALS

200-1 ROCK PRODUCTS

200-1.6 Stone for Riprap

200-1.6.1A Alternate Stone for Riprap. As an alternate to the requirements of Subsection 200-1.6, the sample may be subject to the following tests:

TESTS	TEST METHOD NO.	REQUIREMENTS
Apparent Specific Gravity	ASTM C 127	2.40 Min.
Resistance to Abrasion	ASTM C 535, Grading 1	35% Max.
Soundness	Section 211-8	10% Max.
Wet and Dry Loss	Section 211-9	5% Max.
Solubility	Section 211-10	No Loss

All rock shall be angular or subangular in shape. Angular shall be defined as having sharp corners and straight planes on all faces, with no evidence of wear caused by wind, water or abrasion. Subangular shall be defined the same as angular except that evidence of wear by wind, water or abrasion may be allowed. Determination of angularity will be made by the Engineer.

200-1.6.2 Riprap Size

The individual classes of rock used for riprap shall conform to the following:

Rock Sizes	RIPRAP CLASSES					
	1-Tonne (1-Ton)	½-Tonne (½-Ton)	¼-Tonne (¼-Ton)	Light	Facing	Cobble
	PERCENTAGE LARGER THAN					
2-Tonne (2-Ton)	0-5					
1-Tonne (1-Ton)	50-100	0-5				
½-Tonne (½-Ton)		50-100	0-5			
¼-Tonne (¼-Ton)	90-100		50-100	0-5		
100-kg (200-lb)		90-100		50-100	0-5	
35-kg (75-lb)			90-100	90-100	50-100	0-5
10-kg (25-lb)					90-100	95-100
0.5-kg (1-lb)	100	100	100	100	100	100

The amount of material smaller than the smallest size listed in the table for any class of riprap shall not exceed the percentage limit listed in the table determined on a weight basis.

Compliance with the percentage limit shown in the table for all other sizes of the individual pieces of any class of riprap shall be determined by the ratio of the number of individual pieces larger than the specified size compared to the total number of individual pieces larger than the smallest size listed in the table for that class.

Flat or needle shapes will not be accepted unless the thickness of individual pieces is greater than 1/3 the length.

Before placing in final location, depositing, or stockpiling within the project limits, each individual load of riprap must meet the size requirements of the class specified.

SECTION 206 - MISCELLANEOUS METAL ITEMS

206-3 GRAY IRON AND DUCTILE IRON CASTINGS

206-3.3.2A Manhole Frame and Cover Sets

Unless otherwise specified, manhole frames and covers shall be in accordance with the following Standard Plans contained in the SPPWC:

Clear Opening Diameter mm (Inches)	SPPWC Plan No.	Catalog Numbers	
		Alhambra Foundry	Long Beach Iron Works
600 (24)	630-1	A-1495	X-162
675 (27)	631-1	A-1496	X-164
750 (30)	632-1	A-1497	X-163
900 (36)	633-1	A-1498	X-106A

206-5 METAL RAILINGS.

206-5.2 Flexible Metal Guard Rail Materials.

206-5.2A Flexible Metal Guard Rail Materials; Modification. The "Construction" grade Douglas Fir for "posts, including blocks" does not have to be "free of heart center".

SECTION 210 - PAINT AND PROTECTIVE COATINGS

210-6 STORM DRAIN HARDWARE. All storm drain hardware, including manhole frames and covers, grates, protection bars, steps, etc., shall be protected from corrosion.

Storm drain hardware made of cast iron shall be protected by painting with, or dipping in, a commercial grade asphalt paint. Storm drain hardware made of steel shall be galvanized.

211-6 SIEVE ANALYSIS. Sieve analysis shall be performed in accordance with ASTM C136.

211-7 Sand Equivalent Test. This test is intended to serve as a field test to indicate the presence or absence of plastic fine material. The test shall be run in accordance with Calif. test 217 or ASTM D2419. When testing material containing asphalt, this test method shall be modified by drying the sample at a temperature not exceeding 38°C (100°F).

211-8 R-VALUE. Resistance (R-value) shall be determined by California Test 301.

211-9 SPECIFIC GRAVITY AND ABSORPTION. Apparent specific gravity, bulk specific gravity and absorption shall be determined by California Test 206, 207, 208, 209, 224, 225, or 308, Method C where zinc stearate may be substituted for paraffin.

211-10 LOS ANGELES RATTLER TEST. Loss in Los Angeles Rattler shall be determined by California Test 211.

211-11 SOUNDNESS. For riprap, the soundness shall be determined in accordance with Calif. Test 214, excluding sections D, E, G.2.b, and H, and adding the following:

a. The test sample shall be prepared by breaking or sawing a representative sampling of riprap into particles passing the 75 mm (three inch) and retained on the 50 mm (two inch) sieve. If there are a variety of rock types or degrees of weathering within a rock type, each unique type or condition must meet the loss requirement.

b. The test sample size shall be 25,000 grams (55 lbs.) ± 1 percent.

c. All particles of test sample which break into three or more pieces during testing shall be discarded. The remaining sample shall be washed on a 4.75 mm (#4) sieve and all particles retained shall be oven dried.

d. The loss in weight shall be determined by subtracting from the original weight of the test sample the final weight of all particles retained on the 4.75 mm (#4) sieve. Divide the loss in weight by the original weight and multiply by 100 to determine the percent loss.

e. Report the following:

   (1) The percent loss.

   (2) The number of pieces affected, classified as to number disintegrating, splitting, crumbling, cracking, flaking, etc.

211-12 WET AND DRY LOSS. Wet and dry loss shall be determined as follows:

A sample of rock shall be crushed, screened, oven dried, and 1,000 g (2.2 lbs.) to 1,500 g (3.3 lbs.) of the 19 mm (3/4 inch) to 9.5 mm (3/8 inch) fraction shall be taken for the test.

The crushed and graded sample shall be submerged in tap water for 8 hours at room temperature, after which the sample shall be drained and oven dried at 78°C (140°F). When dry, the sample shall be cooled to room temperature. This completes one cycle.

After 10 cycles, the percent loss shall be computed as follows:

$$\% \text{ Loss} = \frac{100 \times \text{Weight of Material Passing 4.75 mm (No. 4) Sieve}}{\text{Total Weight of Sample}}$$

211-13 SOLUBILITY. Approximately 0.5 kg (one pound), air dried samples shall be immersed in local tap water and in Pacific Ocean water (or a 3.5% sodium chloride solution) for 8 hours each at 78°C (140°F). After immersion, the samples shall be washed with tap water, air dried and reweighed.

211-14 Permeability Test. Permeability tests for granular soils shall be performed in accordance with ASTM D2434, using samples compacted to the specified field density.

PART 3 CONSTRUCTION METHODS

SECTION 301 - TREATED SOILS, SUBGRADE PREPARATION AND PLACEMENT OF BASE MATERIALS

301-1 SUBGRADE PREPARATION

301-1.3 Relative Compaction

301-1.3.1 Firm, Hard and Unyielding. The term "firm, hard and unyielding" as used in 301-1.3 shall mean that when the heaviest construction and hauling equipment used on the Work drives over the subgrade, no permanent deformation shall occur either before or during pavement construction.

301-1.4 Subgrade Tolerances. Subgrade for pavement, sidewalk, curb and gutter, driveways, or other roadway structures shall not vary more than 15 mm (0.05 feet) from the specified grade and cross section. Subgrade for subbase or base material shall not vary more than 15 mm (0.05 feet) from the specified grade and cross section.

Variations within the above specified tolerances shall be compensating so that the average grade and cross section specified are met.

301-2 UNTREATED BASE

301-2.3 Compacting

301-2.3.1 Tolerances. The tolerance requirement in 301-2.3 is modified from 6 mm (0.02 foot) to 15 mm (0.05 foot).

SECTION 302 - ROADWAY SURFACING

302-5 ASPHALT CONCRETE PAVEMENT

302-5.1 General

302-5.1.1 Asphalt Concrete Berms. Asphalt concrete berms shall be constructed of Class III-D-PG70-10 asphalt concrete by mechanical means to conform to the details and location as shown on the Plans.

A tack coat, as provided in 302-5.4, shall be applied to the existing or new pavement preceding the placement of the asphalt concrete berms.

302-5.4 Tack Coat

302-5.4.1 Fog Seal. When specified, a fog seal consisting of material meeting the requirements of 203-3 shall be applied to the surfaces of all completed asphalt concrete at the rate of 0.36 liter per square meter (0.08 gallon per square yard) of the combined emulsion or such lesser rate ordered by the Engineer. Surface to be sealed shall be free from dust, dirt, and other foreign material. Surface shall be sealed within 7 Days after paving.

302-5.9 Measurement and Payment

302-5.9.1 Measurement and Payment for Asphalt Berm. Asphalt concrete berms will be paid for at the Contract Unit Price per linear meter (feet) of berm in place. No separate measurement or payment will be made for asphalt, aggregate, or tack coat.

302-5.9.2 Measurement and Payment for Fog Seal, Tack Coat, and Prime Coat. Measurement and payment for the specified material shall be by the tonne (ton) in place. Emulsions shall be measured after the specified dilution has been made.

SECTION 303 - CONCRETE AND MASONRY CONSTRUCTION

303-5 CONCRETE CURBS, WALKS, GUTTERS, CROSS GUTTERS, ALLEY INTERSECTIONS, ACCESS RAMPS AND DRIVEWAYS

303-5.1 Requirements

303-5.1.4 Concrete Substitution. Class 280-C-14 (470-C-2000) may be used in lieu of Class 310-C-17 (520-C-2500) and Class 280-D-14 (470-D-2000) in lieu of Class 310-D-17 (520-D-2500) as specified in 201-1.1.2 for street surface improvements, excluding concrete pavement, when no class is specified on the Plans or in the Special Provisions.

SECTION 306 - UNDERGROUND CONDUIT CONSTRUCTION 306-1 OPEN TRENCH OPERATIONS

306-1.2 Installation of Pipe

306-1.2.1 Bedding

306-1.2.1.1 Bedding Material. When native material is allowed for backfill in the bedding zone, no rocks larger than 40 mm (1½") in maximum dimensions shall be included. Material containing ashes, cinders, and types of refuse or other deleterious material shall not be used as bedding.

306-1.2.1.2 Sewer Pipe Bedding. Bedding for sewer pipe from 100 mm (4") below the pipe to the spring line (horizontal diameter) of the pipe shall be free draining, granular material with a maximum size of 15 mm (1/2 inch), unless another bedding method is shown on the Plans.

Densification of the bedding material may be by the application of water or by mechanical means. Unless otherwise specified, all bedding material shall be densified to a relative density of 90%. Acceptability of densification in the bedding zone will be determined by visual inspection and probing to determine that no voids exist in the backfill material. In this paragraph, the word "voids" does not include intergranular voids in the soil structure.

306-1.2.1.3 Flexible Pipe Bedding. Bedding for flexible drainage and sewer pipe shall be granular material having a sand equivalent of at least 50. The bedding material shall be placed and compacted from 150 mm (six inches) below the pipe to the top of the bedding as defined in 306-1.2.1. A 1 m (three foot) long section of low permeability material (50% passing 75 μm (200) sieve) shall be installed and mechanically compacted in lieu of the above specified bedding material at intervals of 60 m (200 feet) or as otherwise indicated on the Plans.

306-9 DISINFECTION. All water mains and appurtenances shall be disinfected before being placed in service in accordance with AWWA C651 except as specified herein:

a. The water mains shall be chlorinated so that a chlorine residual of not less than 20 ppm remains in the water after standing in the pipe for 24 hours.

b. The Agency will perform sampling and testing of bacteriologic samples. Disinfection shall be repeated until two or more consecutive samples are negative for coliform organisms.

The pressure in the line being chlorinated shall be maintained at least 35 kPa (5 psi) lower than that existing in any Agency line to which it is connected.

306-10 WATERWORKS APPURTENANCES

306-10.1 Valves. Valves shall be located as shown on the drawings.

Each valve shall be operated prior to its installation to assure proper functioning. Valves shall be installed plumb and in alignment with the water main. Valves shall be anchored by metal ties to a concrete base. Line valves may be moved to the closest joint upon approval of the Engineer.

306-10.2 Valve Boxes. Each underground valve shall be provided with a valve box. The valve boxes shall be installed plumb and centered over the operating nut of the valve. Valve boxes shall be installed with concrete collars.

Where valve boxes are to be placed in asphaltic type pavement, they shall not be set to grade until after paving has been completed.

Where valve boxes are to be placed in concrete pavement, they shall be set to grade prior to paving operations.

306-10.3 Thrust Devices. A reaction or thrust device shall be provided on all dead ends, tees, elbows, and bends with more than 5 degrees deflection on pressure pipelines.

Thrust devices shall be cast-in-place concrete, poured against undisturbed or compacted earth. Thrust devices shall be sized and constructed in accordance with the Plans.

Thrust devices and anchor blocks shall be constructed of Class 280-C-14 (420-C-2000) concrete. Thrust devices and anchor blocks shall be cured at least 7 Days where Type IP or II cement is used or at least 48 hours where Type III cement is used.

Metal tie-rods or clamps shall be of adequate strength to prevent movement of pipe. All metal shall be coated in accordance with AWWA C110.

306-10.4 Fire Hydrants. Fire Hydrants shall be installed as shown on the Plans.

All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the curb, with the pumper nozzle facing the curb, except that hydrants having only two hose nozzles 90 degrees apart shall be set with each nozzle facing the curb at an angle of 45 degrees.

In uncurbed public road rights of way, fire hydrants shall be located as far as possible from the traveled way while providing a 1 m (3-foot) wide clear space between the fire hydrant and the right of way line. In curbed public road rights of way, fire hydrants shall be installed so that there is 300 mm (12 inches) clear between the face of curb and the fire hydrant.

306-10.5 Fire Hydrant Barricades. Fire hydrant barricades shall consist of 100 mm (4-inch) standard steel pipe, schedule 40, filled with concrete, and having a total length of 2 m (72 inches). They shall be embedded in concrete blocks 300 mm (12 inches) in diameter and 1000 mm (40 inches) deep below ground surface with the barricade pipe embedded to 100 mm (4 inches) above the bottom of the concrete so 1 m (36 inches) extends above ground surface. The steel pipe above ground shall be painted chrome yellow in accordance with AWWA C503.

Barricades shall be installed between the fire hydrant and vehicle traffic paths at locations indicated on the Plans or where required by the water purveyor or Fire Department. Barricades shall not be installed within public road rights of way.

Fire hydrant barricades shall not obstruct the hydrant outlets.

310-5 Painting Various Surfaces

310-5.6 Painting Traffic Striping, Pavement Markings, and Curb Markings.

310-5.6.8A Application of Paint - Two Coats All painted traffic striping and markings shall be applied in two coats. The price named in any Bid item for painting traffic striping and markings shall include all costs for both applications, including any delays entailed for the required drying time between applications. If bleeding, curling or discoloration occurs following application of the second coat, unsatisfactory areas shall be given an additional coat, or coats, of paint. No additional payment will be made for work necessary to correct bleeding, curling or discoloration.

PART 4

SECTION 400 - ALTERNATE ROCK PRODUCTS, ASPHALT CONCRETE, PORTLAND CEMENT CONCRETE AND UNTREATED BASE MATERIAL

400-1 Rock Products

400-1.1 Requirements

400-1.1.1 General

Alternate rock material, Type S, as specified in Section 400 may be used on the Work.

400-3 Portland Cement Concrete

Suppliers of portland cement concrete shall file mix designs as required by 400-1.1.2

400-4 Asphalt Concrete

Suppliers of asphaltic cement concrete shall file mix designs as required by 400-1.1.2

ACORD®

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DDNYYY)

THIS CERTIFICATE IS ISSUED **AS A** MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the **certificate holder in lieu of such endorsement(s).**

PRODUCER	CONTACT NAME: PHONE (AIC, No, Ext): E-MAIL ADDRESS:

INSURED	INSURERISI AFFORDING COVERAGE	NAIC#
	INSURER A :	
	INSURER B:	
	JNSURERC:	
	INSURERD:	
	INSURER E :	
	JNSURERF:	

COVERAGES **CERTIFICATE NUMBER·** **REVISION NUMBER·**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	POLICY NUMBER	LIMITS	
	GENERAL LIABILITY		EACH OCCURRENCE	$ See VCSS 7-4.2
	X COMMERCIAL GENERAL LIABILITY		PREMISE_$TEA OCCURRENCE	$
	CLAIMS-MADE OCCUR		MED EXP (Any one person)	$
			PERSONAL & ADV INJURY	$
	GEN'L AGGREGATE LIMIT APPLIES PER:		GENERAL AGGREGATE	$ See VCSS 7-4.2
	POLICY LOC		PRODUCTS - COMP/OP AGG	$
				$
	AUTOMOBILE LIABILITY		Y: ; N OU L M T	s 1 nnn nnn
	X ANY AUTO		BODILY INJURY (Per person)	$
	ALL OWNED AUTOS / SCHEDULED AUTOS		BODILY INJURY (Per accident)	$ 1,000,000
	HIRED AUTOS / NON-OWNED AUTOS		rp ? t AM AGE	S 1,000,000
				$
	UMBRELLA LIAB OCCUR		EACH OCCURRENCE	$
	EXCESS LIAB CLAIMS-MADE		AGGREGATE	$
	DED RETENTION $			$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY YIN		T" J. JTf:T/4;,	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICE/MEMBER EXCLUDED? NIA		EL EACH ACCIDENT	$
	(Mandatory in NH) If yes, describe under		E L DISEASE - EA EMPLOYEE	$
			E L. DISEASE - POLICY LIMIT	$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

(Agency) - (Project Name) (Project Specification number)

The Agency and the County of Ventura, including its boards, all special Districts governed by the Board of Supervisors, agencies, departments, officers, consultants, employees, agents and volunteers, is named as Additional Insured as respects work done by Contractor under the terms of the contract on General Liability and Auto Liability Policies. Waiver of Subrogation is applicable to the Agency and the County of Ventura, its boards, districts, agencies, departments, officers, employees, agents and volunteers for Work Comp and General Liability. Endorsements required for referenced contract will be issued by the Insurance Company.

CERTIFICATE HOLDER

County of Ventura
Public Works Agency L-1670
800 S. Victoria Avenue
Ventura, CA 93009-1670

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE **THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH** THE **POLICY PROVISIONS.**

AUTHORIZED REPRESENTATIVE

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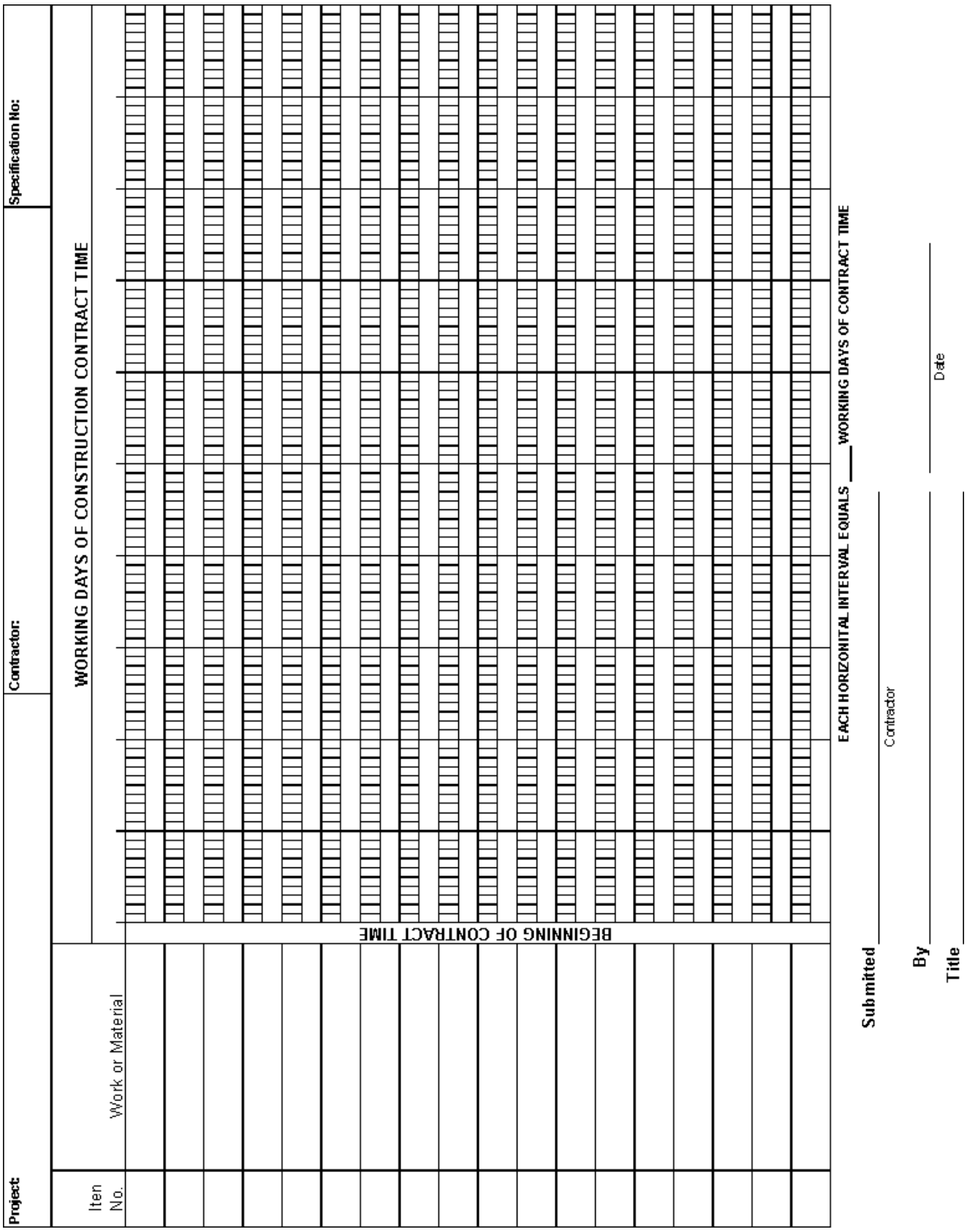
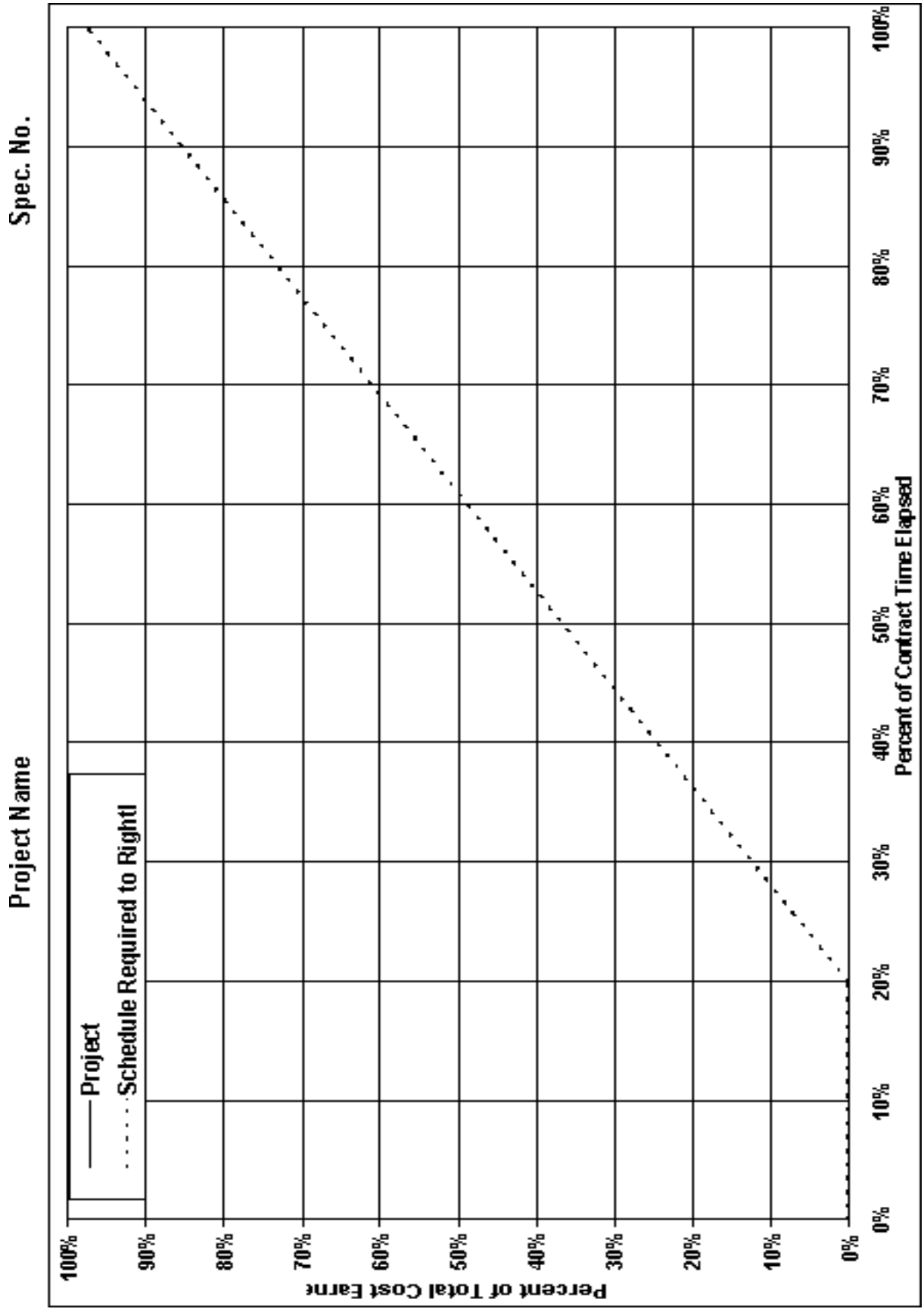
APPENDIX B-1 - CONSTRUCTION ELEMENT VS. TIME CHART FORM



APPENDIX B-2 - WORK COMPLETE VS. TIME CHART FORM



APPENDIX C-1 - CONSTRUCTION ELEMENT VS. TIME CHART SAMPLE

Project: Arroyo Santa Margurita

Contractor: Dilbert and Company Construction

Specification No: FC97-32

Item No.	Work or Material
1 & 2	Mobilization Clearing & Grubbing
3	Removal & Salvage of Existing Facilities
4 & 5	Diversion & Control of Water Excavation Safety
6	Excavation
8 & 9	Reinforcing Steel Concrete for Major Structures
7 & 14	Fill & Backfill Unclassified Fil
12 & 13	Masonary Bolck Wall Planter Wal
18	Surface Coating
10	Surface Drainage Facilities
17	Site Lighting
18 & 19	Fence & Gate
11	Stop Logs & Rack

WORKING DAYS OF CONSTRUCTION CONTRACT TIME

10 20 30 40 50 60 70 80 90

BEGINNING OF CONTRACT TIME

EACH HORIZONITAL INTERVAL EQUALS 1 WORKING DAYS OF CONTRACT TIME

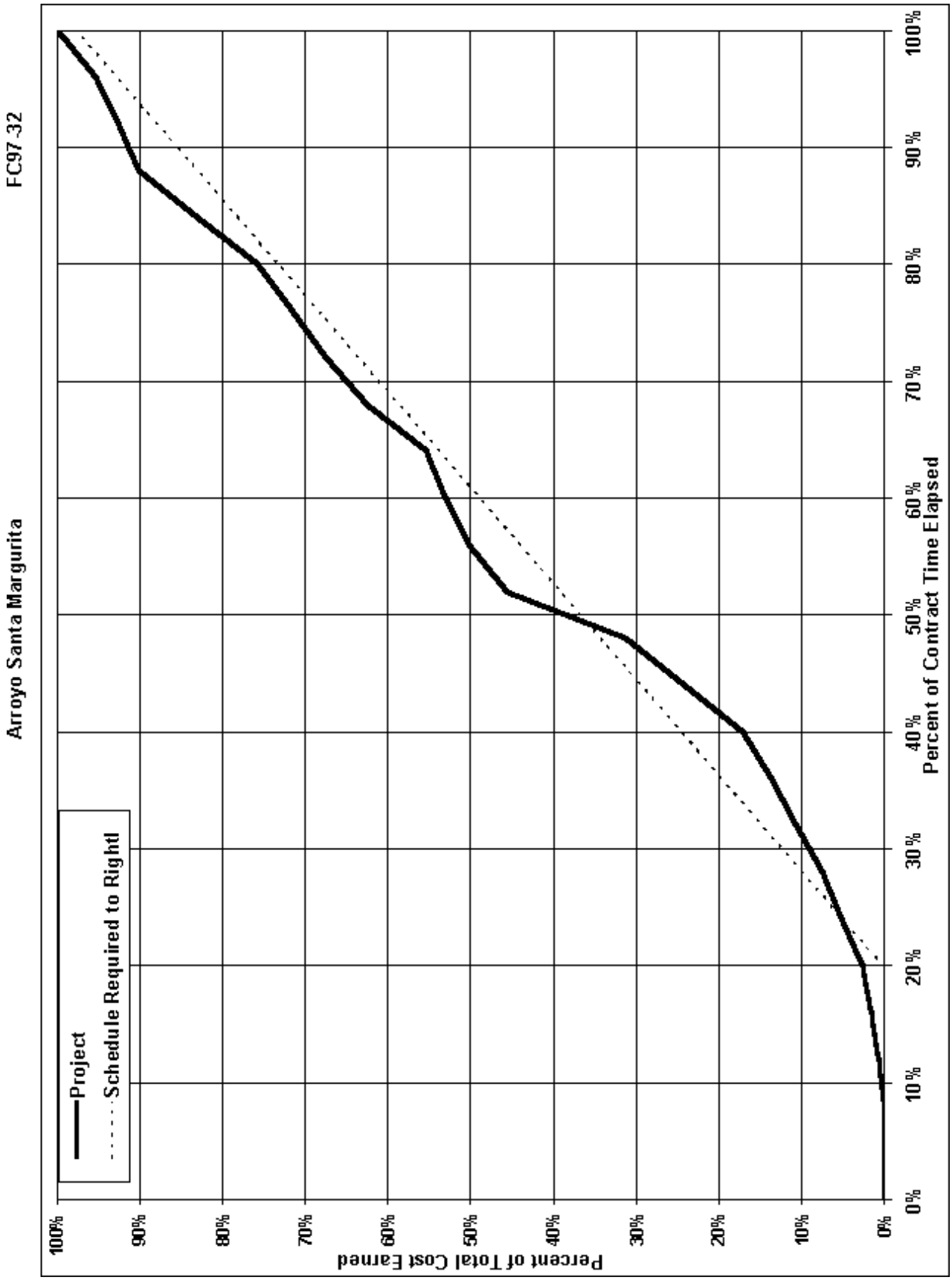
Submitted Dilbert and Company Construction
Contractor

By Tina Blair

5/22/97
Date

Title President

APPENDIX C-2 - WORK COMPLETE VS. TIME CHART SAMPLE



APPENDIX D - ESCROW AGREEMENT FORM SAMPLE

ESCROW AGREEMENT FOR SECURITY DEPOSITS IN LIEU OF RETENTION

This Escrow Agreement is made and entered into by and between
("Agency") whose address is _____ and
("Contractor") whose address is _____ and
("Escrow Agent") whose address is _____.

For the consideration hereinafter set forth, the Agency, Contractor and Escrow Agent agree as follows:

(1) Pursuant to Section 22300 of the Public Contract Code of the State of California, Contractor has the option to deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by Agency pursuant to the Construction Contract entered into between the Agency and Contractor for _____ in the amount of dated _____, (hereinafter referred to as the "Contract") which Contract is identified by Spec. No. _____ and Auditor Controller's Contract No. _____. Alternatively , on written request of the Contractor, the Agency shall make payments of the retention earnings directly to the Escrow Agent. When Contractor deposits the securities as a substitute for Contract earnings, the Escrow Agent shall notify the Agency within ten days of the deposit. The market value of the securities at the time of the substitution shall be at least equal to the cash amount then required to be withheld as retention under the terms of the Contract between the Agency and Contractor. Securities shall be held in the name of _____, and shall designate the Contractor as the beneficial owner.

(2) The Agency shall make progress payments to the Contractor for those funds which otherwise would be withheld from progress payments pursuant to the Contract provisions, provided that the Escrow Agent holds securities in the form and amount specified above.

(3) When the Agency makes payments of retentions earned directly to Escrow Agent, the Escrow Agent shall hold them for the benefit of the Contractor until such time as the escrow created under this contract is terminated. The Contractor may direct the investment of the payments into securities. All terms and conditions of this agreement and the rights and responsibilities of the parties shall be equally applicable and binding when the Agency pays the Escrow Agent directly.

(4) Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the escrow account. These expenses and payment terms shall be determined by the Agency, Contractor and Escrow Agent.

(5) The interest earned on the securities or the money market accounts held in escrow and all interest earned on that interest shall be for the sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to the Agency.

(6) Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from Agency to the Escrow Agent that Agency consents to the withdrawal of the amount sought to be withdrawn by Contractor.

(7) The Agency shall have a right to draw upon the securities in the event of default by the Contractor. Upon seven days' written notice to the Escrow Agent from the Agency of the default, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash as instructed by the Agency.

(8) Upon receipt of written notification from the Agency certifying that the Contract is final and complete, and that the Contractor has complied with all requirements and procedures applicable to the Contract, the Escrow Agent shall release to the Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all moneys and securities on deposit and payments of fees and charges.

(9) Escrow Agent shall rely on the written notifications from the Agency and the Contractor pursuant to Sections (1) to (8), inclusive, of this Agreement and the Agency and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of the securities and interest as set forth above.

(10) The names of the persons who are authorized to give written notice or to receive written notice on behalf of the Agency and on behalf of Contractor in connection with the foregoing, and exemplars of their respective signatures are as follows:

On behalf of Agency:

_____, Director,
Public Works Agency

_____, Director
Central Services Department

_____, Director
Engineering Services Dept

Address for all of the above:
Public Works Agency
800 South Victoria Avenue
Ventura, CA 93009

SAMPLE FORM

Form used for escrow will have names and signatures of persons authorized in accordance with paragraph 10.

On behalf of Contractor:

Title

Name

Signature

Street Address

City & State Zip Code

On behalf of Escrow Agent:

Title

Name

Signature

Street Address

City & State Zip Code

At the time the Escrow Account is opened, the Agency and Contractor shall deliver to the Escrow Agent a fully executed counterpart of this Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement by their proper officers on the date first set forth above.

Agency:
(Agency name)

Title

Name

Signature

Contractor:
(Contractor company name)

Title

Name

Signature

EXHIBIT "A"
ESCROW INSTRUCTIONS

The parties to this escrow are _____("Agency") and _____("Contractor") and _____("Escrow Agent"). Agency and Contractor have entered into a contract for the construction of _____which contract is identified by Spec. No._____ and Auditor-Controller's Contract No._____and was entered into by and between Agency and Contractor ("Construction Contract"). Pursuant to Public Contract Code Section 22300, Contractor may substitute certain securities for an equivalent amount of money required to be withheld from progress payments by Agency to Contractor pursuant to the Construction Contract.

The Escrow Agent is hereby instructed as follows:

1. Contractor may deliver to Escrow Agent:
   (a) Securities of the types specified in Sections 22300 of the Public Contract Code and Section 16430 of the Government Code.
   (b) Such other documents as are necessary to enable Escrow Agent to convert such securities into cash.
2. Upon receipt of such securities and other documents, Escrow Agent shall notify Agency within ten days of the deposit and shall examine them to determine whether they are in a form sufficient to effect conversion of the securities into cash. Escrow Agent shall thereupon send written notice of its determination to Agency.
3. Escrow Agent shall hold such securities as trustee for Agency. The right of Agency to such securities is superior to any other lien or claim of lien; provided, however, that Contractor shall be entitled to any interest earned by such securities prior to their conversion to cash pursuant to section 5 hereof, and further provided that such interest may be withdrawn by Contractor at any time and from time to time without notice to Agency.

   Securities may be substituted by Contractor, but any securities substituted for securities previously deposited shall not reduce the current cash value of securities held below that last reported to Agency by Escrow Agent.
4. Escrow Agent shall determine the current cash value of such securities held by it as of the close of business on the first business day following the_____day of each month and, in addition, on any other days which the Agency may from time to time specify in a written notice to Escrow Agent. Current cash value shall be determined as follows:
   (a) For securities traded over-the-counter or on a stock exchange:
      (1) Determine either the current bid price for the securities as of the close of business or the face value of the securities, whichever is less.
      (2) Subtract the cost of sale (broker commission).
      (3) Subtract all unpaid escrow fees and costs associated therewith.
   (b) For certificates of deposit:
      (1) Determine the face amount.
      (2) Subtract the potential interest penalty for immediate conversion.
      (3) Subtract all unpaid escrow fees and costs associated therewith.
   (c) Determine the value of other securities by procedures calculated to determine net realizable value. Promptly upon making each such determination, Escrow Agent shall notify Agency of the securities held and current cash value of such securities.

5. At any time or times that Agency believes it has a right to do so under the provisions of the Construction Contract, Agency may, without the consent of Contractor, deliver to Escrow Agent a written demand that Escrow Agent convert to cash all or any part of such securities. Upon seven days' written notice from Agency of such demand, Escrow Agent shall convert to cash all or part of such securities as demanded and shall distribute the cash as instructed by the Agency.

6. When the Construction Contract has been satisfactorily completed on the part of Contractor and any stop notices filed against the Construction Contract have been released, Agency shall give written notice to Escrow Agent that such securities may be returned to Contractor. Upon receipt of such written notice and payment of all escrow fees and costs, the Escrow Agent shall deliver to Contractor all money, interest, securities and other documents remaining in escrow and the escrow shall terminate.

7. Contractor, and not Agency, shall be liable to Escrow Agent for all of Escrow Agent's fees and costs associated with this escrow.

8. The Director of the Ventura County Public Works Agency, a Department Director of said Agency, or other person authorized in writing by such Director or Department Director is authorized to give written notice and to make written demands on behalf of Agency pursuant to sections 4, 5 and 6 hereof.

9. All written notices and demands pursuant to the escrow agreement and these Instructions shall be addressed as follows:

   (a) To Agency:

   Director, Ventura County Public Works Agency
   800 South Victoria Avenue
   Ventura, California 93009

   (b) To Contractor:

   (c) To Escrow Agent:

DATED: _____

_____	_____	_____
_____	_____	_____
By _____	**By** _____	**By** _____
Title _____	**Title** _____	**Title** _____
AGENCY	CONTRACTOR	ESCROW AGENT Bank Charter: State [ ] Federal [ ] Escrow Agent's Address: _____ _____

APPENDIX E - BLANK

APPENDIX F **RELEASE ON CONTRACT FORM**

RELEASE ON CONTRACT

CONTRACT NAME: _____

SPEC. NO._____, PROJECT NO. _____

WHEREAS, by the terms of the contract dated ____ _, 20___ entered into by

_____

_____and the undersigned CONTRACTOR,

_____

_____

_____

undersigned CONTRACTOR agreed to perform certain work for the compensation specified in said contract; and

WHEREAS, the CONTRACTOR represents that said work is fully completed and that final payment is due to the CONTRACTOR under terms of said contract,

NOW, THEREFORE, in consideration of the promises and the payment by [AGENCY NAME] to the CONTRACTOR of the amount due under the contract, to wit, the sum of $_____and the additional consideration of $1.00, receipt of which is hereby acknowledged by the CONTRACTOR, the CONTRACTOR hereby releases and forever discharges_____of and from all manner of debts, dues, demands, sum or sums of money, accounts, claims and causes of action, in law and in equity, under or by virtue of said contract except the claim against the Agency for the remainder, if any, of the amounts retained as provided in 9-3.2, any amounts retained as required by Stop Notices or Labor Code Provisions, and any unsettled claims or disputes as follows: (If none, leave blank)

Description of Claim or Dispute	Amount	Date of Claim	Date of Notice of Potential Claim

The CONTRACTOR certifies that each unsettled claim or dispute listed hereon has been processed in compliance with the requirements for making claims under the contract, including giving notice pursuant to the applicable provisions of the contract, and following the procedures for resolution of disputes or claims set forth in subsection 6- 12 of the contract. Acceptance of this Release on Contract by the [Agency Name] shall not be deemed as a waiver or release of its right to contest either the substantive or procedural validity of any listed unsettled claims or disputes.

IN WITNESS WHEREOF, the hand and seal of the CONTRACTOR have been hereunto set this___day of_____, 20___.

THIS FORM MUST BE ACCOMPANIED
by a proper acknowledgement form
(See Civil Code Section 1189)

Contractor

By

Title

APPENDIX G SAMPLE PERFORMANCE AND PAYMENT BOND FORM

Bond No._____

SURETY BONDS

PERFORMANCE BOND

Whereas, the «Agency», hereinafter called "Agency", and «Contr», hereinafter called "principal", have entered into a contract dated «ContrDate» whereby principal agrees to complete certain designated work identified as project «ProjName» (Spec. No.«SpecNo»), and to perform other duties and obligations as described in said contract, which is incorporated herein by this reference and made a part hereof; and

Whereas, principal is required under the terms of said contract to furnish a bond to guarantee principal's faithful performance of the work and all terms and conditions of the contract;

Now, therefore, we the principal and the undersigned, as corporate surety, are held and firmly bound unto Agency in the penal sum of «CostText» ($«OrigCostFmtd») lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, successors, executors and administrators, jointly and severally, firmly by these presents.

The condition of this obligation is such that if the principal, its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions, and provisions in the said contract and any alteration thereof made as therein provided, on principal's part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless Agency, its officers, agents and employees, as therein stipulated, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

The above obligation shall continue after Agency's acceptance of the work for the duration of the warranty period as specified in the contract during which time if principal fails to make full, complete, and satisfactory repair or replacement to the work and/or fails to protect Agency from loss or damage resulting from or caused by defective materials or faulty workmanship, the obligation of surety hereunder shall continue so long as any obligation of principal remains.

PAYMENT BOND

And, whereas, under the terms of said contract, principal is required before entering upon the performance of the work, to file a good and sufficient payment bond with the Agency to secure the claims to which reference is made in Title 3 (commencing with Section 9000) of Part 6 of Division 4 of the Civil Code of the State of California.

Now, therefore, said principal and the undersigned, as corporate surety, are held firmly bound unto the Agency and all contractors, subcontractors, laborers, material suppliers and other persons employed in the performance of the aforesaid contract and referred to in the aforesaid Civil Code in the like sum of «CostText» dollars ($«OrigCostFmtd») for materials furnished or labor thereon of any kind, or for amounts due under the Unemployment Insurance Act with respect to such work or labor, or for any amounts required to be deducted, withheld and paid over to the Franchise Tax Board from the wages of employees of the contractor and the contractor's subcontractors, that said surety will pay the same in an amount not exceeding the amount hereinabove set forth, and also in case suit is brought upon this bond, will pay, in addition to the face amount thereof, costs and reasonable expenses and fees including reasonable attorney's fees incurred in successfully enforcing such obligation, to be awarded and fixed by the court, and to be taxed as costs and to be included in the judgment therein rendered.

It is hereby expressly stipulated and agreed that this bond shall inure to the benefit of any and all persons, companies and corporations entitled to file claims under Title 3 (commencing with Section 9000) of Part 6 of Division 4 of the Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Should this condition of this bond be fully performed, then this obligation shall become null and void; otherwise, it shall be and remain in full force and effect.

GENERAL TERMS

The surety hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of said contract or the plans and specifications accompanying the same shall in any manner affect its obligations on these bonds, and it does hereby waive notice of any such change, extension, alteration or addition.

Nothing herein shall limit the Agency's rights or surety's obligations under the contract or applicable law, including, without limitation, California Code of Civil Procedure section 337.15.

In witness whereof, this instrument has been duly executed by the principal and surety above named

on ,_____, 20 .

«Contr»
Name of Principal

By_____

Title_____

_____
Name of Surety

By_____
Attorney-in-Fact

Address_____

City_____State____Zip

INDICATE COMPLETE ADDRESS OF SURETY TO WHICH CORRESPONDENCE CONCERNING THIS BOND SHOULD BE DIRECTED.

Telephone No._____

A-467/9-Tmpl

SAMPLE BOND FORM

Agency will prepare the Bond in this format and transmit it to the Contractor along with the Contract and the Notice of Award letter.

Surety shall fill in the Bond No., date identification and signature of surety in places provided.

Contractor shall sign and indicate title in place provided.

INTENTIONALLY BLANK

FEDERAL CONTRACT PROVISIONS

INTENTIONALLY BLANK

Required Federal Contract Provisions for FAA Airport Improvement Program Projects

Contents

INTENTIONALLY BLANK

GUIDANCE AND REQUIREMENTS

This project is funded by the Federal Aviation Administration. Federal laws and regulations require that projects funded by federal assistance must include specific contract provisions. Contractor(s), including subcontractors, are required to:

- include certain provisions in their subcontracts and sub-tier agreements.
- incorporate the applicable requirements of these contract provisions by reference for work done under any purchase orders, rental agreements, and other agreements for supplies or services.

The prime contractor shall be responsible for compliance with these contract provisions by any subcontractor, lower-tier subcontractor, or service provider.

Failure to Comply with Provisions:

Contractor failure to comply with the terms of these contract provisions may be sufficient grounds to:

1) Withhold progress payments or final payment;

2) Terminate the contract for cause;

3) Seek suspension/debarment; or

4) Take other actions determined to be appropriate by the Sponsor or the FAA.

A1 ACCESS TO RECORDS AND REPORTS

(2 CFR § 200.333, 2 CFR § 200.336, FAA Order 5100.38)

ACCESS TO RECORDS AND REPORTS

The Contractor must maintain an acceptable cost accounting system. The Contractor agrees to provide the Owner, the Federal Aviation Administration and the Comptroller General of the United States or any of their duly authorized representatives access to any books, documents, papers, and records of the Contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

A2 AFFIRMATIVE ACTION REQUIREMENT

(41 CFR part 60-4, Executive Order 11246)

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Timetables

Goals for minority participation for each trade: **21.5% (Ventura County)**

(Department of Labor online document, Participation Goals for Minorities and Females)

Goals for female participation in each trade: 6.9%

These goals are applicable to all of the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and non-federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a) and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the *goals* will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs (OFCCP) within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this notice and in the contract resulting from this solicitation, the "covered area" is California, Ventura County, and Oxnard.

A3 BREACH OF CONTRACT TERMS

(2 CFR § 200 Appendix II(A)

Applies to all Contracts over $150,000

BREACH OF CONTRACT TERMS

Any violation or breach of terms of this contract on the part of the Contractor or its subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this agreement.

Owner will provide Contractor written notice that describes the nature of the breach and corrective actions the Contractor must undertake in order to avoid termination of the contract. Owner reserves the right to withhold payments to Contractor until such time the Contractor corrects the breach or the Owner elects to terminate the contract. The Owner's notice will identify a specific date by which the Contractor must correct the breach. Owner may proceed with termination of the contract if the Contractor fails to correct the breach by the deadline indicated in the Owner's notice.

The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder are in addition to, and not a limitation of, any duties, obligations, rights, and remedies otherwise imposed or available by law.

A4 BUY AMERICAN PREFERENCE

(Title 49 USC § 50101)

The Buy America requirements flow down from the sponsor to first tier contractors, who are responsible for ensuring that lower tier contractors and subcontractors are also in compliance.

Note: The Buy American Preference does not apply to equipment a contractor uses as a tool of their trade **and does not remain** as part of the project.

There are two types of Buy American certifications.

1. Projects for a facility (Buildings such as Terminal, SRE, ARFF, etc.) – Insert the Certificate of Compliance Based on Total Facility
2. Projects for non-facility development (non-building construction projects such as runway or roadway construction; or equipment acquisition projects)

BUY AMERICAN PREFERENCE

The Contractor agrees to comply with 49 USC § 50101, which provides that Federal funds may not be obligated unless all steel and manufactured goods used in AIP funded projects are produced in the United States, unless the Federal Aviation Administration has issued a waiver for the product; the product is listed as an Excepted Article, Material Or Supply in Federal Acquisition Regulation subpart 25.108; or is included in the FAA Nationwide Buy American Waivers Issued list.

A bidder or offeror must complete and submit the Buy America certification included herein with their bid or offer. The Owner will reject as nonresponsive any bid or offer that does not include a completed Certificate of Buy American Compliance.

Certificate of Buy American Compliance for Manufactured Products

As a matter of bid responsiveness, the bidder or offeror must complete, sign, date, and submit this certification statement with their proposal. The bidder or offeror must indicate how they intend to comply with 49 USC § 50101 by selecting one on the following certification statements. These statements are mutually exclusive. Bidder must select one or the other (not both) by inserting a checkmark (✓) or the letter "X".

☐ Bidder or offeror hereby certifies that it will comply with 49 USC § 50101 by:

a) Only installing steel and manufactured products produced in the United States;

b) Installing manufactured products for which the Federal Aviation Administration (FAA) has issued a waiver as indicated by inclusion on the current FAA Nationwide Buy American Waivers Issued listing; or

c) Installing products listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation Subpart 25.108.

By selecting this certification statement, the bidder or offeror agrees:

- To provide to the Owner evidence that documents the source and origin of the steel and manufactured product.
- To faithfully comply with providing U.S. domestic product.
- To furnish U.S. domestic product for any waiver request that the FAA rejects
- To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

☐ The bidder or offeror hereby certifies it cannot comply with the 100 percent Buy American Preferences of 49 USC § 50101(a) but may qualify for either a Type 3 or Type 4 waiver under 49 USC § 50101(b). By selecting this certification statement, the apparent bidder or offeror with the apparent low bid agrees:

a) To the submit to the Owner within 15 calendar days of the bid opening, a formal waiver request and required documentation that supports the type of waiver being requested.

b) That failure to submit the required documentation within the specified timeframe is cause for a non-responsive determination may result in rejection of the proposal.

c) To faithfully comply with providing U.S. domestic products at or above the approved U.S. domestic content percentage as approved by the FAA.

d) To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

Required Documentation

Type 3 Waiver – The cost of the item components and subcomponents produced in the United States is more that 60 percent of the cost of all components and subcomponents of the "item". The required documentation for a Type 3 waiver is:

a) Listing of all product components and subcomponents that are not comprised of 100 percent U.S. domestic content (Excludes products listed on the FAA Nationwide Buy American Waivers Issued listing and products excluded by Federal Acquisition Regulation Subpart 25.108; products of unknown origin must be considered as non-domestic products in their entirety).
b) Cost of non-domestic components and subcomponents, excluding labor costs associated with final assembly at place of manufacture.
c) Percentage of non-domestic component and subcomponent cost as compared to total "item" component and subcomponent costs, excluding labor costs associated with final assembly at place of manufacture.

Type 4 Waiver – Total cost of project using U.S. domestic source product exceeds the total project cost using non-domestic product by 25 percent. The required documentation for a Type 4 of waiver is:

a) Detailed cost information for total project using U.S. domestic product
b) Detailed cost information for total project using non-domestic product

False Statements: Per 49 USC § 47126, this certification concerns a matter within the jurisdiction of the Federal Aviation Administration and the making of a false, fictitious or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code.

********Sign Buy American Certifications that are included in the bid forms package*********

A5 CIVIL RIGHTS - GENERAL

(49 USC § 47123)

GENERAL CIVIL RIGHTS PROVISIONS

The Contractor agrees to comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance.

This provision binds the Contractor and subcontractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required by Title VI of the Civil Rights Act of 1964.

A6 CIVIL RIGHTS – TITLE VI ASSURANCE

(49 USC § 47123, FAA Order 1400.11)

A6.1 Title VI Solicitation Notice:

Ventura County, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 USC §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders or offerors that it will affirmatively ensure that any contract entered into pursuant to this advertisement,

disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

A6.2 Compliance with Nondiscrimination Requirements:

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "Contractor"), agrees as follows:

1. **Compliance with Regulations:** The Contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts and Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. **Nondiscrimination:** The Contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.
3. **Solicitations for Subcontracts, including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the Contractor of the contractor's obligations under this contract and the Nondiscrimination Acts and Authorities on the grounds of race, color, or national origin.
4. **Information and Reports:** The Contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts and Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the Contractor will so certify to the sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.
5. **Sanctions for Noncompliance:** In the event of a Contractor's noncompliance with the non-discrimination provisions of this contract, the sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:
    a) Withholding payments to the Contractor under the contract until the Contractor complies; and/or
    b) Cancelling, terminating, or suspending a contract, in whole or in part.
6. **Incorporation of Provisions: <u>The Contractor will include the provisions of paragraphs one through six in every subcontract</u>,** including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The Contractor will take action with respect to any subcontract or procurement as the sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the Contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the Contractor may request the sponsor to enter into

any litigation to protect the interests of the sponsor. In addition, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

Title VI List of Pertinent Nondiscrimination Acts and Authorities

Insert this list in every contract or agreement

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "Contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 USC § 2000d et seq., 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR part 21 (Non-discrimination in Federally-assisted programs of the Department of Transportation—Effectuation of Title VI of the Civil Rights Act of 1964);
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 USC § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973 (29 USC § 794 et seq.), as amended (prohibits discrimination on the basis of disability); and 49 CFR part 27;
- The Age Discrimination Act of 1975, as amended (42 USC § 6101 et seq.) (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982 (49 USC § 471, Section 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987 (PL 100-209) (broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act of 1990, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 USC §§ 12131 – 12189) as implemented by U.S. Department of Transportation regulations at 49 CFR parts 37 and 38;
- The Federal Aviation Administration's Nondiscrimination statute (49 USC § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures nondiscrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 USC 1681 et seq).

A7 CLEAN AIR AND WATER POLLUTION CONTROL

(2 CFR § 200, Appendix II(G))

Contract Types – This provision is required for all contracts and lower tier contracts that exceed $150,000.

CLEAN AIR AND WATER POLLUTION CONTROL

Contractor agrees to comply with all applicable standards, orders, and regulations issued pursuant to the Clean Air Act (42 USC § 740-7671q) and the Federal Water Pollution Control Act as amended (33 USC § 1251-1387). The Contractor agrees to report any violation to the Owner immediately upon discovery. The Owner assumes responsibility for notifying the Environmental Protection Agency (EPA) and the Federal Aviation Administration.

Contractor must include this requirement in all subcontracts that exceeds $150,000.

A8 CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS

(2 CFR § 200, Appendix II€)

This provision applies to all contracts and lower tier contracts that exceed $100,000, and employ laborers, mechanics, watchmen, and guards.

CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS

1. Overtime Requirements.

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic, including watchmen and guards, in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; Liability for Unpaid Wages; Liquidated Damages.

In the event of any violation of the clause set forth in paragraph (1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this clause, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this clause.

3. Withholding for Unpaid Wages and Liquidated Damages.

The Federal Aviation Administration (FAA) or the Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the

same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this clause.

4. Subcontractors.

The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (1) through (4) and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this clause.

A9 COPELAND "ANTI-KICKBACK" ACT

(2 CFR § 200, Appendix II(D), 29 CFR Parts 3 and 5)

This provision applies to all construction contracts and subcontracts financed under the AIP that exceed $2,000.

COPELAND "ANTI-KICKBACK" ACT

Contractor must comply with the requirements of the Copeland "Anti-Kickback" Act (18 USC 874 and 40 USC 3145), as supplemented by Department of Labor regulation 29 CFR part 3. Contractor and subcontractors are prohibited from inducing, by any means, any person employed on the project to give up any part of the compensation to which the employee is entitled. The Contractor and each Subcontractor must submit to the Owner, a weekly statement on the wages paid to each employee performing on covered work during the prior week. Owner must report any violations of the Act to the Federal Aviation Administration.

A10 DAVIS-BACON REQUIREMENTS

(2 CFR § 200, Appendix II(D), 29 CFR Part 5)

***Construction* – Incorporate into all construction contracts and subcontracts that exceed $2,000 and include funding from the AIP.**

DAVIS-BACON REQUIREMENTS

1. Minimum Wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be

paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination;

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the Contractor, the laborers, or mechanics to be employed in the classification, or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii) (B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program: Provided that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding.

The Federal Aviation Administration or the sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of work, all or part of the wages required by the contract, the Federal Aviation Administration may, after written notice to the Contractor, Sponsor, Applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and Basic Records.

(i) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 1(b)(2)(B) of the Davis-Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records that show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and that show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit the payrolls to the applicant, Sponsor, or Owner, as the case may be, for transmission to the Federal Aviation Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. the last four digits of the employee's social security

number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at www.dol.gov/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker and shall provide them upon request to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit them to the applicant, sponsor, or Owner, as the case may be, for transmission to the Federal Aviation Administration, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, Sponsor, or Owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) The payroll for the payroll period contains the information required to be provided under 29 CFR § 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR § 5.5 (a)(3)(i), and that such information is correct and complete;

(2) Each laborer and mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations 29 CFR Part 3;

(3) Each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the “Statement of Compliance” required by paragraph (3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The Contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the sponsor, the Federal Aviation Administration, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, Sponsor, applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination that provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate that is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the

wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal Employment Opportunity. The utilization of apprentices, trainees, and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act Requirements.

The Contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

6. Subcontracts.

The Contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR Part 5.5(a)(1) through (10) and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR Part 5.5.

7. Contract Termination: Debarment.

A breach of the contract clauses in paragraph 1 through 10 of this section may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes Concerning Labor Standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of Eligibility.

(i) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 USC 1001.

A11 DEBARMENT AND SUSPENSION

(2 CFR part 180 (Subpart C). 2 CFR part 1200, DOT Order 4200.5)

This provision is required to be included in any AIP-funded contract, regardless of tier, that is awarded by a contractor, subcontractor, supplier, consultant if the amount of the contract is equal to or exceeds $25,000.

CERTIFICATION OF OFFERER/BIDDER REGARDING DEBARMENT

By submitting a bid/proposal under this solicitation, the bidder or offeror certifies that neither it nor its principals are presently debarred or suspended by any Federal department or agency from participation in this transaction.

CERTIFICATION OF LOWER TIER CONTRACTORS REGARDING DEBARMENT

The successful bidder, by administering each lower tier subcontract that exceeds $25,000 as a "covered transaction", must verify each lower tier participant of a "covered transaction" under the project is not presently debarred or otherwise disqualified from participation in this federally assisted project. The successful bidder will accomplish this by:

1. Checking the System for Award Management at website: http://www.sam.gov.
2. Collecting a certification statement similar to the Certification of Offerer/Bidder Regarding Debarment, above.
3. Inserting a clause or condition in the covered transaction with the lower tier contract.

If the Federal Aviation Administration later determines that a lower tier participant failed to disclose to a higher tier participant that it was excluded or disqualified at the time it entered the covered transaction, the FAA may pursue any available remedies, including suspension and debarment of the non-compliant participant.

A12 DISADVANTAGED BUSINESS ENTERPRISE

(49 CFR part 26)

Information submitted as a matter of bidder responsibility:

The Owner's award of this contract is conditioned upon Bidder or Offeror satisfying the good faith effort requirements of 49 CFR §26.53.

The successful Bidder or Offeror must provide written confirmation of participation from each of the DBE firms the Bidder or Offeror lists in its commitment **within five days of Notice of Apparent Low Bid.**

1) The names and addresses of Disadvantaged Business Enterprise (DBE) firms that will participate in the contract;
2) A description of the work that each DBE firm will perform;
3) The dollar amount of the participation of each DBE firm listed under (1)
4) Written statement from Bidder or Offeror that attests their commitment to use the DBE firm(s) listed under (1) to meet the Owner's project goal; and
5) If Bidder or Offeror cannot meet the advertised project DBE goal, evidence of good faith efforts undertaken by the Bidder or Offeror as described in appendix A to 49 CFR part 26.

The requirements of 49 CFR part 26 apply to this contract. It is the policy of Ventura County to practice nondiscrimination based on race, color, sex, or national origin in the award or performance of this contract. The Owner encourages participation by all firms qualifying under this solicitation regardless of business size or ownership.

DISADVANTAGED BUSINESS ENTERPRISES

Contract Assurance (§ 26.13) – The Contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of Department of Transportation-assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the Owner deems appropriate, which may include, but is not limited to:

1) Withholding monthly progress payments;
2) Assessing sanctions;
3) Liquidated damages; and/or
4) Disqualifying the Contractor from future bidding as non-responsible.

Prompt Payment (§26.29) – The prime contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than 30 days from the receipt of each payment the prime contractor receives from Ventura County. The prime contractor agrees further to return retainage payments to each subcontractor within 30 days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of Ventura County. This clause applies to both DBE and non-DBE subcontractors.

A13 DISTRACTED DRIVING

(Executive Order 13513, DOT Order 3902.10)

The Contractor must include the substance of this clause in all sub-tier contracts exceeding $3,500 that involve driving a motor vehicle in performance of work activities associated with the project.

TEXTING WHEN DRIVING

In accordance with Executive Order 13513, "Federal Leadership on Reducing Text Messaging While Driving", (10/1/2009) and DOT Order 3902.10, "Text Messaging While Driving", (12/30/2009), the Federal Aviation Administration encourages recipients of Federal grant funds to adopt and enforce safety policies that decrease crashes by distracted drivers, including policies to ban text messaging while driving when performing work related to a grant or subgrant.

In support of this initiative, the Owner encourages the Contractor to promote policies and initiatives for its employees and other work personnel that decrease crashes by distracted drivers, including policies that ban text messaging while driving motor vehicles while performing work activities associated with the project. The Contractor must include the substance of this clause in all sub-tier contracts exceeding $3,500 that involve driving a motor vehicle in performance of work activities associated with the project.

A14 ENERGY CONSERVATION REQUIREMENTS

(2 CFR § 200, Appendix II(H))

Include this provision in all AIP funded contracts and lower-tier contracts.

ENERGY CONSERVATION REQUIREMENTS

Contractor and Subcontractor agree to comply with mandatory standards and policies relating to energy efficiency as contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 USC 6201, *et seq.*).

A15 RESERVED

A16 EQUAL EMPLOYMENT OPPORTUNITY

(2 CFR 200, Appendix II(c), 41 CFR § 60-1.4, 41 CFR § 60-4.3, Executive Order 11246)

The EEO Opportunity "Contract Clause" must be included (without modification) in any contract or subcontract when the amount exceeds $10,000.

EQUAL OPPORTUNITY CONTRACT CLAUSE

During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, sexual orientation, gender identify, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff, or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

(3) The Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the Contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: *Provided, however,* that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS

1. As used in these specifications:

   a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;

   b. "Director" means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;

   c. "Employer identification number" means the Federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;

   d. "Minority" includes:

      (1) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

      (2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin regardless of race);

      (3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

      (4) American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR part 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors shall be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through 7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in a geographical area where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement nor the failure by a union with whom the Contractor has a collective bargaining agreement to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees shall be employed by the Contractor during the training period and the Contractor shall have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees shall be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore along with whatever additional actions the Contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or female sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions, including specific review of these items, with onsite supervisory personnel such superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other contractors and subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students; and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written

notification to organizations, such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated except that separate or single user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (7a through 7p). The efforts of a contractor association, joint contractor union, contractor community, or other similar groups of which the Contractor is a member and participant may be asserted as fulfilling any one or more of its obligations under 7a through 7p of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, if the particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally), the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR part 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee, the name, address, telephone number, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g. those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

A17 FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE)

(29 USC § 201, et seq)

All consultants, sub-consultants, contractors, and subcontractors employed under this federally assisted project must comply with the FLSA.

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR part 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part-time workers.

The *Contractor* has full responsibility to monitor compliance to the referenced statute or regulation. The *Contractor* must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division.

A18 LOBBYING AND INFLUENCING FEDERAL EMPLOYEES

(31 USC § 1352 – Byrd Anti-Lobbying Amendment, 2 CFR part 200, Appendix II(J), 49 CFR part 20, Appendix A)

Contractor must include Lobbying Certification and this language (not modified) in subcontracts exceeding $100,000.

CERTIFICATION REGARDING LOBBYING

The Bidder or Offeror certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the Bidder or Offeror, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that **the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements)** and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

A19 PROHIBITION of SEGREGATED FACILITIES

(41 CFR § 60)

This clause must be included in all contracts that include the Equal Opportunity clause, regardless of the amount of the contract. This obligation flows down to subcontract and sub-tier purchase orders containing the Equal Employment Opportunity clause.

PROHIBITION OF SEGREGATED FACILITIES

(a) The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained.

The Contractor agrees that a breach of this clause is a violation of the Equal Employment Opportunity clause in this contract.

(b) "Segregated facilities," as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.

(c) The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Employment Opportunity clause of this contract.

A20 OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

(29 CFR part 1910)

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. The employer must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The employer retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20 CFR Part 1910). The employer must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

A21 PROCUREMENT OF RECOVERED MATERIALS

(2 CFR § 200.322, 40 CFR part 247, Solid Waste Disposal Act)

PROCUREMENT OF RECOVERED MATERIALS

Contractor and subcontractor agree to comply with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, and the regulatory provisions of 40 CFR Part 247. In the performance of this contract and to the extent practicable, the Contractor and subcontractors are to use products containing the highest percentage of recovered materials for items designated by the Environmental Protection Agency (EPA) under 40 CFR Part 247 whenever:

1) The contract requires procurement of $10,000 or more of a designated item during the fiscal year; or
2) The contractor has procured $10,000 or more of a designated item using Federal funding during the previous fiscal year.

The list of EPA-designated items is available at www.epa.gov/smm/comprehensive-procurement-guidelines-construction-products.

Section 6002(c) establishes exceptions to the preference for recovery of EPA-designated products if the contractor can demonstrate the item is:

a) Not reasonably available within a timeframe providing for compliance with the contract performance schedule;
b) Fails to meet reasonable contract performance requirements; or
c) Is only available at an unreasonable price.

A22 RIGHT TO INVENTIONS

(2 CFR § 200, Appendix II(F), FR §401)

Not Applicable.

A23 SEISMIC SAFETY

(49 CFR part 41)

SEISMIC SAFETY

The Contractor agrees to ensure that all work performed under this contract, including work performed by subcontractors, conforms to a building code standard that provides a level of seismic safety substantially equivalent to standards established by the National Earthquake Hazards Reduction Program (NEHRP). Local building codes that model their code after the current version of the International Building Code (IBC) meet the NEHRP equivalency level for seismic safety.

A24 TAX DELINQUENCY AND FELONY CONVICTIONS

(DOT Order 4200.6 - Requirements for Procurement and Non-Procurement Regarding Tax Delinquency and Felony Convictions)

Bidder: if awarded a contract resulting from this solicitation, this provision must be incorporated in all lower tier subcontracts.

CERTIFICATION OF OFFERER/BIDDER REGARDING TAX DELINQUENCY AND FELONY CONVICTIONS

The applicant must complete the following two certification statements. The applicant must indicate its current status as it relates to tax delinquency and felony conviction by inserting a checkmark (✓) in the space following the applicable response. The applicant agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification in all lower tier subcontracts.

Certifications

1) The applicant represents that it is ( ) is not ( ) a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

2) The applicant represents that it is ( ) is not ( ) is not a corporation that was convicted of a criminal violation under any Federal law within the preceding 24 months.

Note

If an applicant responds in the affirmative to either of the above representations, the applicant is ineligible to receive an award unless the sponsor has received notification from the agency suspension and debarment official (SDO) that the SDO has considered suspension or debarment and determined that further action is not required to protect the Government's interests. The applicant therefore must provide information to the owner about its tax liability or conviction to the Owner, who will then notify the FAA Airports District Office, which will then notify the agency's SDO to facilitate completion of the required considerations before award decisions are made.

Term Definitions

Felony conviction: Felony conviction means a conviction within the preceding twenty-four (24) months of a felony criminal violation under any Federal law and includes conviction of an offense defined in a section of the U.S. code that specifically classifies the offense as a felony and conviction of an offense that is classified as a felony under 18 U.S.C. § 3559.

Tax Delinquency: A tax delinquency is any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

********Certification form is included in the bid forms package*********

A25 TERMINATION OF CONTRACT

(2 CFR § 200 Appendix II(B), FAA Advisory Circular 150/5370-10, Section 80-09)

TERMINATION FOR CONVENIENCE (CONSTRUCTION & EQUIPMENT CONTRACTS)

The Owner may terminate this contract in whole or in part at any time by providing written notice to the Contractor. Such action may be without cause and without prejudice to any other right or remedy of Owner. Upon receipt of a written notice of termination, except as explicitly directed by the Owner, the Contractor shall immediately proceed with the following obligations regardless of any delay in determining or adjusting amounts due under this clause:

1) Contractor must immediately discontinue work as specified in the written notice.
2) Terminate all subcontracts to the extent they relate to the work terminated under the notice.
3) Discontinue orders for materials and services except as directed by the written notice.
4) Deliver to the Owner all fabricated and partially fabricated parts, completed and partially completed work, supplies, equipment and materials acquired prior to termination of the work, and as directed in the written notice.
5) Complete performance of the work not terminated by the notice.
6) Take action as directed by the Owner to protect and preserve property and work related to this contract that Owner will take possession.

Owner agrees to pay Contractor for:

1) completed and acceptable work executed in accordance with the contract documents prior to the effective date of termination;
2) documented expenses sustained prior to the effective date of termination in performing work and furnishing labor, materials, or equipment as required by the contract documents in connection with uncompleted work;
3) reasonable and substantiated claims, costs, and damages incurred in settlement of terminated contracts with Subcontractors and Suppliers; and
4) reasonable and substantiated expenses to the Contractor directly attributable to Owner's termination action.

Owner will not pay Contractor for loss of anticipated profits or revenue or other economic loss arising out of or resulting from the Owner's termination action.

The rights and remedies this clause provides are in addition to any other rights and remedies provided by law or under this contract.

TERMINATION FOR DEFAULT (CONSTRUCTION)

Section 80-09 of FAA Advisory Circular 150/5370-10 establishes conditions, rights, and remedies associated with Owner termination of this contract due to default of the Contractor.

TERMINATION FOR DEFAULT (EQUIPMENT)

The Owner may, by written notice of default to the Contractor, terminate all or part of this Contract if the Contractor:

1) Fails to commence the Work under the Contract within the time specified in the Notice- to-Proceed;
2) Fails to make adequate progress as to endanger performance of this Contract in accordance with its terms;
3) Fails to make delivery of the equipment within the time specified in the Contract, including any Owner approved extensions;
4) Fails to comply with material provisions of the Contract;
5) Submits certifications made under the Contract and as part of their proposal that include false or fraudulent statements; or
6) Becomes insolvent or declares bankruptcy.

If one or more of the stated events occur, the Owner will give notice in writing to the Contractor and Surety of its intent to terminate the contract for cause. At the Owner's discretion, the notice may allow the Contractor and Surety an opportunity to cure the breach or default.

If within 10 days of the receipt of notice, the Contractor or Surety fails to remedy the breach or default to the satisfaction of the Owner, the Owner has authority to acquire equipment by other procurement action. The Contractor will be liable to the Owner for any excess costs the Owner incurs for acquiring such similar equipment.

Payment for completed equipment delivered to and accepted by the Owner shall be at the Contract price. The Owner may withhold from amounts otherwise due the Contractor for such completed equipment, such sum as the Owner determines to be necessary to protect the Owner against loss because of Contractor default.

Owner will not terminate the Contractor's right to proceed with the Work under this clause if the delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such acceptable causes include: acts of God, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, and severe weather events that substantially exceed normal conditions for the location.

If, after termination of the Contractor's right to proceed, the Owner determines that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the Owner issued the termination for the convenience the Owner.

The rights and remedies of the Owner in this clause are in addition to any other rights and remedies provided by law or under this contract.

A26 TRADE RESTRICTION CERTIFICATION

(49 USC § 50104, 49 CFR part 30)

Bidder: If awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in all lower tier subcontracts.

TRADE RESTRICTION CERTIFICATION

By submission of an offer, the Offeror certifies that with respect to this solicitation and any resultant contract, the Offeror:

1) is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms as published by the Office of the United States Trade Representative (USTR);

2) has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country included on the list of countries that discriminate against U.S. firms as published by the USTR; and

3) has not entered into any subcontract for any product to be used on the Federal project that is produced in a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18 USC Section 1001.

The Offeror/Contractor must provide immediate written notice to the Owner if the Offeror/Contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The Contractor must require subcontractors provide immediate written notice to the Contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, **no contract shall be awarded to an Offeror or subcontractor:**

1) who is owned or controlled by one or more citizens or nationals of a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR, or

2) whose subcontractors are owned or controlled by one or more citizens or nationals of a foreign country on such USTR list, or

3) who incorporates in the public works project any product of a foreign country on such USTR list.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

The Offeror agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in all lower tier subcontracts. The Contractor may rely on the certification of a prospective subcontractor that it is not a firm from a foreign country included on the list of countries that discriminate against U.S. firms as published by USTR, unless the Offeror has knowledge that the certification is erroneous.

This certification is a material representation of fact upon which reliance was placed when making an award. If it is later determined that the Contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration (FAA) may direct through the Owner cancellation of the contract or subcontract for default at no cost to the Owner or the FAA.

A27 VETERAN'S PREFERENCE

(49 USC § 47112(c))

VETERAN'S PREFERENCE

In the employment of labor (excluding executive, administrative, and supervisory positions), the Contractor and all sub-tier contractors must give preference to covered veterans as defined within Title 49 United States Code Section 47112. Covered veterans include Vietnam-era veterans, Persian Gulf veterans, Afghanistan-Iraq war veterans, disabled veterans, and small business concerns (as defined by 15 USC 632) owned and controlled by disabled veterans. This preference only applies when there are covered veterans readily available and qualified to perform the work to which the employment relates.

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PROJECT SPECIFIC REQUIREMENTS FOR AIRPORT CONSTRUCTION

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PART 1

Technical Specifications

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SP-100 General Requirements for Airport Construction

100-1.1 Overview. This section provides for construction safety in an Airport environment; limitations on construction operations; minimum requirements for construction management and scheduling; and site-specific information pertaining to potential impacts on construction activities. Unless otherwise noted, all costs associated with related work shall be included in the Contract pay item for Airfield Safety and Traffic Control.

100-1.2 Construction and Safety Phasing Plan (CSPP). A Construction Safety and Phasing Plan has been prepared for this project. Contractor shall comply with the CSPP included as *Project Specific Requirements for Airport Construction Part 2 (SP2)*. Included as part of the requirements of the CSPP is the Safety Plan Compliance Document (SPCD) to be completed by the Contractor. (Notice to Proceed for Construction will not be issued until SPCD is approved.)

100-1.3 Security Access. The Contractor shall be responsible for obtaining security badges for supervisory and any other necessary construction personnel from the Airport Administration Office. The security badge requirements and any costs shall be included in the bid item for Airfield Safety and Traffic Control.

Refer to the CSPP for specific requirements and training.

100-1.4 Submittals. All materials and equipment used to construct this work shall be submitted to the RPR for approval prior to ordering the equipment.

The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the Drawings and Contract Documents. The RPR reserves the right to reject any and all equipment, materials or procedures, which, in the RPR's opinion, do not meet the system design and the standards and codes specified.

For items listed under 'a.' below – the Contractor shall provide the submittals at least five (5) working days prior to the pre-construction meeting. Issuance of a Notice to Proceed is dependent on the timelines and the proper level of detail of these submittals. Submittals shall be submitted to the RPR electronically.

Submittals shall include items as detailed in *Attachment 1*, Contractor's Materials and Equipment Submittal Checklist, and below, but are not limited to:

a. General Requirements
   Key Personnel, Telephone Numbers, and Emergency Telephone Numbers
   Project Construction Schedule (CPM)

b. Site Work - including but not limited to *Attachment 1*, Contractor's Materials and Equipment Submittal Checklist

Manufacturer's catalogs (or excerpts thereof) and affidavits of compliance with the Contract Documents shall be submitted for all materials to be used on the project. Alternate products may be approved by the RPR upon submittal of the following information and subject to the acceptance of the FAA.

The Agency will not consider an alternate product that does not have adequate demonstrated experience and meet all performance requirements of this specification.

Contractor shall allow a minimum of ten (10) working days for evaluation of requests for substitution or deviation from the Contract Documents.

100-1.5 Submittal Procedures.

a. Submit electronic submittals via email as PDF electronic files.

b. Each submittal item shall be individually numbered accordingly to the checklist, so that approved and rejected submittals can be tracked.

c. Edit submittals so that the submittal specifically applies to only the equipment furnished. Neatly cross out all extraneous text, options, models, etc. that do not apply to the equipment being furnished, so that the information remaining is only applicable to the equipment furnished.

d. Present measurements in customary American units (feet, inches, pounds, etc.).

e. After the initial submittal package, a separate transmittal form shall be used for each subsequent submittal, specific item, or class of material or equipment for which a submittal is required. However, transmittal of a submittal of various items using a single transmittal form will be allowed when the items taken together constitute a "package" or are so functionally related that expediency dictates review of the package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the RPR.

f. Each transmittal shall identify the specification section that relates to item being submitted.

g. After checking and verifying all field measurements, the Contractor shall thoroughly review each shop drawing for compliance and compatibility and stamp "APPROVED" and sign each shop drawing to indicate that a thorough review was made by the Contractor and that the Contractor has approved the shop drawing for the project prior to submission for the RPR's review.

(1) Submittals shall bear a stamp or specific written indication that Contractor has satisfied its responsibilities under the Contract Documents with respect to the review of the submittal and have a signature by the Contractor.

(2) Data shown shall be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to enable RPR to review the information.

(3) Submittals shall specify by checking a box "Yes" or "No" as to whether the submittal meets the Buy American requirements. All submittals shall be accompanied with Buy American certifications or Buy American waivers. Only Third Party certified manufacturers, listed in AC 150/5345-53, Appendix 3 Addendum (as required) and meeting the BUY AMERICAN preference requirements can provide equipment and materials specified in the Contract Documents. Documentation certifying compliance with the BUY AMERICAN preference rules for Airport Improvement Program (AIP) cited in 49 USC §50101) shall be included with each equipment and material submittal.

h. Check the samples and accompany with specific written indication that Contractor has satisfied requirements under the Contact Documents with respect to review of submittals, and identify clearly as to material, supplier, pertinent data such as catalog numbers and the intended use.

i. Before submission of each submittal, determine and verify quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar data with respect thereto; review and coordinate each submittal with other submittals, requirements of work, and the Contract Documents.

j. Submittals shall specify by checking a box "Yes" or "No" as to whether the submittal contains variations to the Contract. At the time of each submission, give RPR specific written notice of each variation that the submittal may have from the requirements of the Contract Documents; in addition, make specific notation on each shop drawing submitted to RPR for review and approval of each such variation.

k. The RPR will review up to two (2) submittals for each item. It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the RPR by the second submission of a

submittal item. All costs to review shop drawings submitted more than twice to receive a “Re-submittal Not Required” or other approval designation, shall be borne by the Contractor. The Agency reserves the right to withhold moneys due the Contractor to cover additional cost of the RPR’s review beyond the second submittal.

l. The RPR's review is for general conformance to the Contract Documents and no check will be made to confirm dimensions, compatibility with other elements of the Work, or deviations from the Contract Documents which have not been specifically identified by the Contractor. Contractor is responsible for the installation of complete, functional improvements in accordance with the Contract Documents.

m. RPR’s review will be only for conformance with the design concept of the project and for compliance with the information given in the Contract Documents, not extending to means, methods, techniques, sequences, or procedures of construction (except where a specific means, method, technique, sequence, or procedure of construction is indicated in or required by the Contract Documents) nor to safety precautions or programs incident thereto. The review of a separate item as such will not indicate the review of the assembly in which the item functions.

n. Where a shop drawing or sample is required by the Specifications, related work performed prior to RPR’s review and approval of the pertinent submission shall be the sole expense and responsibility of Contractor.

o. Review, acceptance, or approval of substitutions, schedules, shop drawings, list of materials, and procedures submitted or requested by Contractor shall not add to the Contract amount, and additional costs which may result therefrom shall be solely the obligation of Contractor.

p. The Agency is not responsible to provide engineering or other services to protect Contractor from additional costs accruing from submittals.

q. Submittals processed by RPR do not become Contract Documents and are not Change Orders. The purpose of submittal review is to establish a reporting procedure and is intended to allow the RPR to monitor Contractor’s progress and understanding of the design.

r. Delays caused by the need for re-submittal shall not constitute a basis for claim.

s. The Agency reserves the right to modify the procedures and requirements for submittals, as necessary to accomplish the specific purpose of each submittal. Direct inquiries regarding the procedure, purpose, or extent of any submittal shall be submitted to the RPR.

100-1.6 Lines, Grades, and Survey Control. The Contractor shall provide construction and layout staking for the RPR to review and confirm prior to work being started. The use of GPS is allowed. The RPR will be given 48 hours' notice of pavement section layers, pavement marking, electrical facility layout, and pavement marking layout so it may be checked. Contractor is responsible for verifying the existing and tie-in locations for the improvements shown on the Plans. Any discrepancies shall be reported to the RPR immediately and prior to removal of existing pavement to determine if design modifications need to be addressed. RPR shall be allowed a minimum of 48 hours to render a decision.

Contractor shall notify the RPR immediately regarding any survey monuments, benchmarks, control points, stakes or marks, etc., that are in jeopardy of being disturbed or destroyed by construction, so that they may be relocated and perpetuated.

Construction Staking and Layout includes but is not limited to:

a. Clearing and Grubbing perimeter staking
b. Rough Grade slope stakes at 100-foot (30-m) stations
c. Drainage Swales slope stakes and flow line blue tops at 50-foot stations

Subgrade (top of lime treated subgrade) blue tops at 25-foot stations and 25-foot offset distance (maximum) for the following section locations:

a. Runway – minimum five (5) per station
b. Taxiways – minimum three (3) per station
c. Holding apron areas – minimum three (3) per station
d. Roadways – minimum three (3) per station

Base Course blue tops at 25-foot stations and 25-foot offset distance (maximum) for the following section locations:

a. Runway – minimum five (5) per station
b. Taxiways – minimum three (3) per station
c. Holding apron areas – minimum three (3) per station

Pavement areas:

a. Edge of Pavement hubs and tacks (for stringline by Contractor) at 100-foot stations.
b. Between Lifts at 25-foot stations for the following section locations:
    (1) Runways – each paving lane width
    (2) Taxiways – each paving lane width
    (3) Holding areas – each paving lane width
c. After finish paving operations at 25-foot stations:
    (1) All paved areas – Edge of each paving lane prior to next paving lot
    (2) Final survey of runway and taxiways shall include centerline, quarter point, and edge of pavement. Any areas that do not comply for elevation or width from centerline will need to be removed up to the nearest paving lane.
d. Shoulder and safety area blue tops at 50-foot stations and at all break points with maximum of 50-foot offsets.
e. Electrical and Communications System locations, lines and grades including but not limited to duct runs, connections, fixtures, signs, lights, Visual Approach Slope Indicators (VASIs), Precision Approach Path Indicators (PAPIs), Runway End Identifier Lighting (REIL), Wind Cones, Distance Markers (signs), pull boxes and manholes.
f. Post construction survey of all electrical facilities.
g. Drain lines, cut stakes and alignment on 25-foot stations, inlet and manholes.
h. Painting and Striping layout (pinned with 1.5 inch PK nails) marked for paint Contractor. (All nails shall be removed after painting).
i. Final survey of pavement markings at layout locations identified on the plans.
j. Laser, or other automatic control devices, shall be checked with temporary control point or grade hub at a minimum of once per 400 feet per pass (i.e., 400 feet per paving lane).

Surveys shall be performed by a Professional Land Surveyor. AutoCAD (version 2020) files and signed/sealed PDFs shall be provided to RPR for review.

The establishment of Survey Control and/or reestablishment of survey control shall be by a Licensed Land Surveyor in the State of California. Controls and stakes disturbed or suspect of having been disturbed shall be checked and/or reset as directed by the RPR without additional cost to the Owner. The Contractor shall include the associated costs in the Contract item for Construction Staking and Survey Layout.

100-1.7 Record Drawings. The Contractor shall maintain Record Drawings of all work continuously as the job progresses. A separate set of prints, for this purpose only, shall be kept at the job site at all times. It shall be required that these Drawings be up to date and be reviewed by the field inspector at the time each progress bill is submitted. All deviations from the Drawings, exact locations and sizes of all utilities, mechanical and electrical lines, equipment details, and all stub outs and connections for future ex-

pansion, shall be incorporated. Fees for documentation of Record Drawings shall be included in other items of work and no separate payment will be made.

100-1.8 Material Testing and Retesting. All Quality Control shall be performed by the Contractor per Item C-100, Contractor Quality Control Program. Contractor shall submit Quality Control reports to the RPR for review of test results and frequency of testing in conformance with Contract Documents. All acceptance testing will be performed by the RPR as necessary.

In the event the acceptance tests do not pass and the RPR is required to retest the area, the cost for each retest shall be borne by the Contractor at the cost of the work plus 25% markup.

100-1.9 Schedule of Values. A schedule of value(s) shall be provided for each lump sum bid item within 5 days of request. The schedule of values shall be in the form of a detailed, itemized cost breakdown of the lump sum amount that includes the profit and overhead costs for each item including a line-by-line breakdown of labor and materials. All work to be performed by subcontractors shall be listed. The schedule of values, once established, will serve as the basis for estimating or evaluating the percentage of lump sum work completed for progress payments. Progress payments on Unit Price Work will be based on the number of units completed. The schedule of values may also be used to evaluate the impact of unbalanced pricing.

100-1.10 Time Limitations. The overall time of completion for this Project is as follows based on project award.

Contract Award	Mobilization Element, Phase 1	Mobilization Element, Phase 2	Construction Element, Phase 1	Construction Element, Phase 2	Total
Base Bid Only	14 Calendar Days	28 Calendar Days	91 Calendar Days	14 Calendar Days	147 Calendar Days
Base Bid + Bid Alternate 1	14 Calendar Days	28 Calendar Days	98 Calendar Days	14 Calendar Days	154 Calendar Days
Base Bid + Bid Alternates 1 & 2	14 Calendar Days	28 Calendar Days	105 Calendar Days	14 Calendar Days	161 Calendar Days

Should this time schedule not be met, liquidated damages will be assessed. Refer to the CSPP for detailed time limitations for the specific work areas. A summary of contract time is divided as follows:

A. Mobilization Element. Notice to Proceed with Mobilization shall be given immediately after award of Contract. All work included in Mobilization shall be completed within 42 calendar days; 14 calendar days for Mobilization Element Phase 1, and 28 calendar days for Mobilization Element Phase 2 (to begin only after Mobilization Element Phase 1 is completed).

B. Construction Element. Notice to Proceed with Construction shall be issued at the Agency's discretion after the Mobilization Element is complete. All work included in the Construction element shall be completed within the working days specified.

100-1.11 Liquidated Damages. Liquidated Damages in the amount of Five Hundred Dollars ($500) per Calendar Day will be assessed for failure to complete Mobilization Element Phase 1 within the timelines specified. Liquidated Damages in the amount of Nine Thousand Dollars ($9,000) per Calendar Day will be assessed for failure to complete the Construction Element of the Project or the overall Project within the Contract Time allowed. Since Mobilization Element Phase 2 is concurrent with the Construction Element, no additional Liquidated Damages will be assessed for this Phase. If failure to complete the requirements of Mobilization Phase 2 in a timely manner results in a delay of the Construction Element, Liquidated Damages will be assessed for the Construction Element as specified herein. Refer to the CSPP for descriptions of the Mobilization and Construction Elements.

100-1.12 Barricades and Delineators. The Contractor is responsible for providing, placing, and maintaining 8-foot, low-profile barricades, including batteries as needed; and shall provide two solar flashing lights and one 18-inch by 18-inch orange vinyl flag for each of the barricades. Contractor is responsible for additional barricades needed during project.

Additionally, the Contractor shall provide plastic delineators as required to barricade hazardous areas. Unless otherwise approved by the RPR, delineators shall be 42-inch-high molded plastic. Delineators shall be four inches in diameter, florescent orange, supplied with a double-weighted base and reflective stripes. Lighting for delineators will be provided at night as approved by the RPR. All costs associated with this item shall be included in Airfield Safety and Traffic Control.

The Agency shall determine the appropriate locations for the low-profile barricades and the delineators with respect to the proximity to aircraft.

100-1.13 Lighted Runway Closure Markers. The Contractor shall provide one set of trailer-mounted closure crosses. The Contactor will be responsible for placing, fueling, lubricating, maintaining flashing lights, and removing closure crosses. Runway closure markers will be placed on runways whenever runways are closed. When erected on the runway, the lighted markers shall be a minimum 14 feet on a side, inclined toward the approach end of the runway, and lighted crosses will be on 24/7. During the project, the Contractor shall have, at a minimum, one spare closure cross as a contingency in the event one of the crosses fails to operate. The contractor shall be responsible for checking and replacing bulbs on a daily basis. The lighted markers shall be removed by the contractor prior to opening per the schedule approved by the RPR. All costs associated with this item shall be included in Airfield Safety and Traffic Control.

100-1.14 High-visibility Fence. The contractor shall provide, install and maintain high-visibility plastic fence around NAVAIDs including MALSF, localizer, glideslope, PAPIs, and lighted windcones to be protected in place. All costs associated with this item shall be included in Airfield Safety and Traffic Control.

100-1.15 Aviation Radios. The Contractor is to provide at least two hand-held aviation radios to be used in communications with the Air Traffic Control Tower (ATCT) as specified in the CSPP. Radios shall be ICOM-IC-A6 transceivers, each supplied with battery pack, spare battery pack, whip antenna, desktop charger, and a 12V adaptor/charger. On completion of the Project the radios become the property of the Contractor. Providing the radios shall be included under the Contract price for Airfield Safety and Traffic Control.

100-1.16 Access and Security.

A. Contractor Access. Contractor access to the various work areas shall be via the closest access routes indicated on the Project Layout Plan. Additional haul routes on Airport property shall be approved by the Airport. All access routes and haul routes shall be kept clean and free of debris. Dust control shall be maintained. Where haul routes cross active runways, taxiways, or aprons, radio-equipped flaggers shall be provided by the Contractor as required to control movement of construction equipment and personnel.

B. Access Security Control.

The Contractor shall be responsible for maintaining Airport security at all gates designated for his use. Gates must be locked or manned by the Contractor's personnel to ensure no unauthorized access to the air operations area. All access gates shall be kept clear of equipment and material.

100-1.17 Work Hour Limitations. See CSPP for work hours per area.

100-1.18 Adverse Weather Conditions as Determined by the RPR. If, due to the onset of adverse weather as determined by the RPR, the Project cannot be satisfactorily completed, the Contractor may

request the Agency to issue a notice to stop work. At that time, the Contractor shall perform that work necessary to winterize/prepare the Project as directed by the Agency. Contract time will stop on the date the notice is issued. The Contractor shall maintain the construction area as required over the severe weather conditions. When weather improves, another Notice to Proceed shall be issued and the Project shall then be completed. Additional payment will not be made in the event an adverse weather shutdown is necessary. The Contractor shall honor all bid prices when construction resumes.

100-1.19 Construction Delay due to COVID-19. Once the Mobilization Element is complete and materials have been procured or a firm schedule for procurement is established, the Contractor shall determine if lack of an adequate labor force, materials and/or supplies due to the COVID-19 outbreak may have an impact on commencing and completing Construction in a timely manner. The Contractor, County, and RPR will arrive at a mutual determination as to whether the Construction Element should be delayed as a result of the COVID-19 outbreak. Due to the nature and geometry of the Project, suspending work once it has started will result in an incomplete product and will be detrimental to Airport operations.

A Notice to proceed with the Construction Element will be issued once the conditions described herein are met, and the Contractor, County, and RPR determine the Project can be satisfactorily completed without an anticipated suspension due to COVID-19 factors. Additional payment will not be made in the event a delay of the Construction Element is necessary. The Contractor shall honor all bid prices when construction commences.

100-1.20 Construction Water Meter Requirements. The Contractor is responsible for contacting the City of Oxnard to apply for a construction water meter. Please contact:

City of Oxnard – Water Service Division
305 West 3rd Street, Oxnard, California 93030
(805) 385-7816

The Contractor shall be responsible for all fees and charges to obtain construction water.

No separate measurement and payment will be made for construction water. All costs shall be included in other items of work.

Airport will specify the water location the contractor can utilize. Any other location will need to be approved in writing by the County.

100-1.21 Hearing Protection. Due to the nearby aircraft operations, the Contractor shall provide all necessary hearing protection for workers.

100-1.22 Cultural Resources Assessment. In the event that archaeological materials are encountered during construction, all construction work shall be halted, and a Ventura Agency certified archaeologist shall be consulted to determine the appropriate treatment of the discovery.

In the event human remains are encountered, State Health and Safety Code – Section 7050.5 states that, no further disturbance shall occur until the Agency Coroner has made a determination of origin and disposition pursuant to Public Resources Code – Section 5097.98. The Agency Coroner must be notified of the find immediately.

If the remains are determined to be Native American, the Agency Coroner will notify the Native American Heritage Commission (NAHC), which will determine and notify a Most Likely Descendant (MLD). With the permission of the landowner or his/her authorized representative, the MLD may inspect the site of the discovery. The MLD shall complete the inspection within 48 hours of notification by the NAHC. The MLD will have the opportunity to offer recommendations for the disposition of the remains.

100-1.23 Application for Payment and Required Items. Applications for payment shall follow the standard County format based on the schedule of items included in the proposal forms. The Contractor shall also supplement the pay application with amounts being paid to subcontractors and the amounts

being paid to DBE firms. Subcontractor and DBE amounts shall be delineated by bid items in the proposal forms.

100-1.24 Place Asphalt Compacted Grindings. This item consists of asphalt millings and existing base resulting from partial and full depth removal of the existing pavement section. Asphalt compacted grindings shall be placed on the contractor staging area as shown in the Plans and in conformance with the Plan details. Material larger than 2 inches in any dimension shall not be permitted. Grindings shall be placed to allow for positive drainage of the area and adjacent areas and shall be compacted to 98% maximum density. The asphalt compacted grindings shall remain on site at the end of the construction. Additional grindings shall not mixed with the subgrade within the pavement section area shall hauled off per P-152.

100-1.25 Airport Access and Haul Route Repair. For repairs to the haul roads required at the end of the construction when hauling operations are complete. Repairs will be a result of construction activities and not by the Contractor's negligence. Contractor shall mill and place 2" of surface course P-401 asphalt in areas defined by the RPR. Field adjustments may need to be made to the scope of work, based on the severity of pavement failure. Nothing in this paragraph waives the Contractor's requirements to maintain haul roads and paved areas throughout the project.

100-1.26 In-place Drying Techniques. This item covers in-place drying techniques for the areas of the Project improvements. Geotechnical Engineering Reports and Addendum were prepared by Earth Systems Pacific, dated July 10, 2020 for this Project and are included as *Attachment 2* to the specifications. The results of the findings included moist and expansive soils.

While preparing the subgrade prior to lime treating, any material containing vegetable or organic matter such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Unsuitable material is defined as material the RPR determines to be:

(1) Of such unstable nature as to be incapable of being compacted to specified density using ordinary methods at optimum moisture content; or
(2) Too wet to be properly compacted and circumstances prevent suitable in-place drying prior to incorporation into the work.

The presence of excessive moisture in a material is not, by itself, sufficient cause for determining that the material is unsuitable. Immediate in-place drying techniques shall be employed prior to classifying the material as unsuitable. In-place drying techniques shall consist of ripping, windrowing, discing, and otherwise manipulating, twice daily, up to a 2-foot depth of material below the subgrade elevation, in 6 to 8-inch lifts for up to 2 consecutive working days (without rain) to achieve drying and compaction. Rubber-tired excavation and vibratory or steel drum compaction equipment shall not be used in unstable areas unless specifically approved by the RPR. The lower foot of the 2-depth of manipulated material should be compacted to 85% relative compaction, and the upper foot compacted to 90% compaction. Discing is mandatory.

If these drying techniques fail (if unhealed by the lime-treating process or at the direction of the RPR) the material shall be removed as detailed herein or stabilized as detailed below. In-place drying techniques, if directed by the RPR, will be paid under its respective bid item.

100-1.27 Subgrade Stabilization, Excavation Below Subgrade. The subsurface soils within the project limits contain expansive and moist native materials that become unstable when excessively wet. The Contractor shall give due diligence to subgrade moisture and avoid overwatering subgrade during compaction. Watered subgrade or base rock more than five percent (5%) above optimum moisture content shall be assumed to be overly wet and any instability that may occur shall be the responsibility of the Contractor to remedy with no additional payment. If, despite due care in watering, areas of subgrade become unstable or show unacceptable deflection during compaction after the lime treatment, they shall be dried as described above and subsequently stabilized as directed by the RPR as follows:

(1) The pumping area, as designated by the RPR, shall be over excavated to a depth of 24 inches below the grading plane and the excavated material shall be disposed of off-site.
(2) A multi-axial geogrid polymer fabric shall be placed in the bottom of the excavation and covered with 12 inches of asphalt millings and/or existing aggregate base material compacted to 85 percent relative compaction.
(3) Place layer of multi-axial geogrid polymer fabric below before filling the remaining 12 inches of excavation with asphalt millings and/or existing aggregate base material in 6-inch lifts. The lower lift shall be compacted to 90 percent relative compaction and the top lift compacted to 95 percent relative compaction.

The multi-axial geogrid shall have an overlap of 2 feet at roll joints and shall be pinned to secure and shall be placed in accordance with manufacture's recommendations. Multi-axial geogrid shall meet the requirements detailed within this Specification.

The RPR reserves the right to require as much subgrade stabilization as necessary to satisfy site conditions. The significant change in character of work (work alteration and quantity variance) limitations of Section 40-02 shall not apply to this item.

No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been approved by the RPR.

100-1.28 Multi-axial Geogrid. Geogrid shall have the following properties:

Property	Test Reference	Specification
Aperture Shape	Observation	Triangular[1]
Radial Stiffness @ 0.5% strain lbs/ft, Min.	ASTM D6637[2]	15,430
Radial Stiffness Ratio, dimensionless	ASTM D6637[3]	>0.60
Junction Strength Efficiency (%)	ASTM D7737[4]	93
Ultraviolet Stability, @ 500 hrs (%)	ASTM D4355-05	70

(1) Multi-axial geogrid contains six or more intersecting ribs at each junction formed into a radially stable network of open equilateral triangular apertures.
(2) Minimum measured radial stiffness at 0.5% strain. Radial stiffness is measured on both the rib directions and the mid-rib directions (directions that bisect the angles between ribs).
(3) Ratio of the minimum to maximum MARV values of radial stiffness at 0.5% strain.
(4) Load transfer capability determined in accordance with ASTM D7737 and ASTM D6637 and expressed as a percentage.

Geogrid shall be placed within the excavation as described in paragraph SP-100-1.27, if required by the RPR. No limitations on change of quantity shall apply to this item.

100-1.29 Underground Utility Investigation and Potholing. The Plans depict underground utilities derived from record drawings and field investigations. Not all utilities locations or depths are known. Within two weeks prior to the completion of the Mobilization Element, the Contractor shall coordinate for location services. As the first part of work in the Construction Element and prior to the installation of underground utility systems, the Contractor shall pothole utility locations and verify location and depth. Contractor shall verify electrical pullboxes labeled in the Existing Conditions Plan Sheets are empty. If cables are found, Contractor shall verify/find power source. All work shall be coordinated with and performed under the observation of the RPR or their designated representative. Excavations within pavement limits shall be backfilled and capped with asphalt concrete (cold patch is acceptable). Contractor will document locations, depth, and type of utility and provide information to the RPR prior to full production work.

100-1.30 Installation of Runway Threshold Survey Monuments. This item shall consist of furnishing, installing, and verifying runway threshold survey monuments in conformance with the details and dimensions shown on the Plans. Concrete used in this item shall conform to the requirements of Item P-610. Cover and frame shall be per the dimensions shown on the Plans, constructed of cast iron and rated for 250 psi tire pressure. Solid brass marker shall be of survey monument quality.

Excavation for monuments shall be such that the adjoining pavement or base materials are not disturbed. The hole in the asphalt concrete or Portland Cement Concrete pavement shall be made with a coring machine as approved by the RPR.

The runway threshold marker shall be installed as indicated on the plans. The actual runway threshold location shall be stamped into the brass marker by a Professional Surveyor licensed in the State of California and include survey verification and registration of the control point. The monument shall be etched with the date of installation, height above sea level, datum, and the phrase “OXNARD AIRPORT SURVEY MONUMENT”.

The Contractor shall exercise due diligence in maintaining cleanliness on the runway during construction. Laitance and slurry from coring shall be immediately removed with water to avoid staining the pavement surface. Excavated material shall not be placed on the runway surface. At completion of installation, the area shall be thoroughly swept and washed clean with water. Pressure washing shall be performed, if necessary, to adequately clean the area.

100-1.31 Install Checkpoint Markers. Prior to any work on the Runway and MALSF system and in coordination with FAA, Contractor shall locate and survey existing ILS (LOC/GS) ground. Contractor shall install disturbed check point markers within the paving/grading work areas in conformance with the details and dimensions shown on the Plans.

100-1.32 FAA Joint Acceptance Inspection and Flight Check. Contractor and electrical subcontractor shall be present during FAA Joint Acceptance Inspection (JAI) and flight check. Everything noted in the JAI shall be cleared by the Contractor/Sponsor no later than 30 calendar days from the JAI inspection.

METHOD OF MEASUREMENT

100-2.1 Airfield Safety and Traffic Control, and all incidentals required to complete work described in this section will be measured as lump sum, as a percentage of the construction schedule.

100-2.2 Construction Staking and Survey Layout will be measured as a lump sum item as a percentage of the construction schedule.

100-2.3 Airport Access and Haul Route Repair, and all incidentals required to complete work described in this section, will be measured by the square yard.

100-2.4 In-place Drying Techniques will be measured by the square yard of material manipulated as described herein to a 2-foot depth, as directed by the RPR.

100-2.5 Subgrade Stabilization, Excavation Below Subgrade will be measured by the number of cubic yards to be replaced as directed by the RPR.

100-2.6 Multi-axial Geogrid will be measured by the number of square yards of ground covered as directed by the RPR. Overlap and edge anchoring will not be measured.

100-2.7 Place Asphalt Compacted Grindings will be measured by the number of square yards of ground covered, 24-inches thick, as directed by the RPR.

100-2.8 Underground Utility Investigation and Potholing will be measured per hour, rounded to the nearest quarter hour, as directed by the RPR.

100-2.9 Install Runway Threshold Survey Monument, and all incidentals required to complete work described in this section will be measured by each monument placed.

100-2.10 Install Checkpoint Markers, and all incidentals required to complete work described in this section will be measured as a lump sum item. The number of checkpoint markers to be installed is expected not to be more than ten.

100-2.11 FAA Joint Acceptance Inspection and Flight Check will be incidental to Airfield Safety and Traffic Control per SP-100 and no separate payment will be made.

BASIS OF PAYMENT

100-3.1 Airfield Safety and Traffic Control will be paid for at the Contract lump sum price. This price shall include full compensation for all labor, materials, tools, equipment, CSPP compliance, SPCD preparation and compliance, and incidentals necessary to complete the work as specified in this Specification and requirements shown on the Plans.

100-3.2 Construction Staking and Survey Layout will be paid for at the Contract lump sum price and shall include all staking and survey required to construct the Project to the lines and grades as indicated on the Plans to meet the specified tolerances.

100-3.3 Airport Access and Haul Route Repair will be paid for at the Contract price per square yard of mill and overlay. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item. This item will not be paid for without prior authorization from the RPR for specific areas identified. Alterations of bid quantity greater than twenty-five (25%) percent will not result in change in unit bid price.

100-3.4 In-Place Drying Techniques will be paid for at the Contract price per square yard of material manipulated as described herein to a 2-foot depth as directed by the RPR. This item will not be paid for without prior authorization from the RPR for specific areas identified. Alterations of bid quantity greater than twenty-five (25%) percent will not result in change in unit bid price.

100-3.5 Subgrade Stabilization, Excavation Below Subgrade will be paid for at the Contract price per cubic of material manipulated as described herein to a 2-foot depth as directed by the RPR. This item will not be paid for without prior authorization from the RPR for specific areas identified. Alterations of bid quantity greater than twenty-five (25%) percent will not result in change in unit bid price. Payment shall include excavation and backfilling with asphalt millings and/or existing aggregate base material and all work necessary including furnishing all labor, tools, equipment, and incidentals. Backfilling with asphalt millings and/or existing aggregate base shall be considered incidental and no separate payment shall be made. Geogrid shall be paid under the respective item.

100-3.6 Multi-axial Geogrid will be paid for at the Contract price per square yard of area covered and include all materials, equipment, and labor necessary to complete the item where specified. This item will not be paid for without prior authorization from the RPR for specific areas identified. Alterations of bid quantity greater than twenty-five (25%) percent will not result in change in unit bid price.

100-3.7 Placement of Asphalt Compacted Grindings will be paid for at the Contract price per square yard of area covered, 24-inches thick, and include all materials, equipment, and labor necessary to complete the item where specified.

100-3-8 Underground Utility Investigation and Potholing field work, to verify location of existing underground utility services shall be performed and paid for on a unit price basis per hour and provided to

the RPR. The hourly unit of measurement, rounded to the nearest quarter hour, shall include full compensation for all labor, material and equipment necessary to complete operations, including a superintendent, an operator, a laborer, and a backhoe (minimum 2 person crew with one piece of equipment). Cold patch and any materials necessary to perform the Underground Utility Investigation and Potholing will be incidental to the "per hour" costs. Any hours spent performing utility investigation beyond contract quantity shall be incidental to the items for which investigation is required.

100-3.9 Install Runway Threshold Survey Monument will be paid for at the contract unit price per each. This price shall be full compensation for furnishing and installing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

100-3.10 Install Checkpoint Markers will be paid for at the Contract lump sum price. This price shall be full compensation for coordination, survey, furnishing and installing all materials, labor, equipment, tools, and incidentals necessary to complete the item.

100-3-11 No separate payment will be made for FAA Joint Acceptance Inspection and Flight Check. It is incidental to Airfield Safety and Traffic Control per SP-100.

Payment will be made under:

Item SP-100-3.1	Airfield Safety and Traffic Control – per lump sum
Item SP-100-3.2	Construction Staking and Survey Layout – per lump sum
Item SP-100-3.3	Airport Access and Haul Route Repair – per square yard
Item SP-100-3.4	In-place Drying Techniques – per square yard
Item SP-100-3.5	Subgrade Stabilization, Excavation Below Subgrade – per cubic yard
Item SP-100-3.6	Multi-axial Geogrid – per square yard
Item SP-100-3.7	Place Asphalt Compacted Grindings, 24-inches thick – per square yard
Item SP-100-3.8	Underground Utility Investigation and Potholing – per hour
Item SP-100-3.9	Install Runway Threshold Survey Monument – per each
Item SP-100-3.10	Install Checkpoint Markers – per lump sum

END OF ITEM SP-100

Item SP-102A Water Pollution Control, Erosion Control, and SWPPP

DESCRIPTION

102-1.1 Erosion Control shall conform to the FAA and Ventura County Standard Specifications and shall consist of applying Erosion Control materials to the areas shown on the Plans, embankment and excavation slopes and other areas disturbed by construction activities and as directed by the RPR.

The Contractor will be responsible for the fees associated with submitting the Notice of Intent and SWPPP measures.

102-1.2 Water pollution control (for projects with over 1 acre of disturbed area). Prior to any construction activity, the Contractor shall prepare, submit, pay Notice of Intent Fee, and obtain approval of a Stormwater Pollution Prevention Plan (SWPPP) in accordance with the NPDES General Construction Permit for stormwater and non-stormwater discharges associated with construction activities, entitled: "National Pollutant Discharge Elimination System (NPDES) Permit – Water Quality Order 2009-0009-DWQ. Approval of the SWPPP shall not relieve the Contractor of any liability for violations of State or Federal law relating to water pollution.

Approval of the NPDES permit that regulates this project, as referenced above, is hereafter collectively referred to as the "Permit."

This project shall conform to the Permit and modifications thereto. The Contractor shall maintain copies of the Permit at the project site and shall make the Permit available during construction.

The Contractor shall know and fully comply with applicable provisions of the Permit and all modifications thereto, and Federal, State, and local regulations and requirements that govern the Contractor's operations and stormwater and non-stormwater discharges from both the project site and areas of disturbance outside the project limits during construction.

The Permit shall apply to stormwater and certain permitted non-stormwater discharges from areas outside the project site which are directly related to construction activities for this contract including, but not limited to, asphalt batch plants, material borrow areas, concrete plants, staging areas, storage yards, and access roads. The Contractor shall comply with the Permit for those areas and shall implement, inspect, and maintain the required water pollution control practices. Installing, inspecting, and maintaining water pollution control practices on areas outside the right-of-way not specifically arranged and provided for by the Ventura County for the execution of this contract, will not be paid for.

The Contractor shall be responsible for penalties assessed or levied on the Contractor or the Ventura County as a result of the Contractor's failure to comply with the provisions in this section "Water Pollution Control" including, but not limited to, compliance with the applicable provisions of the Permit, and Federal, State, and local regulations and requirements as set forth therein.

Penalties as used in this section, "Water Pollution Control," shall include fines, penalties and damages, whether proposed, assessed, or levied against the County of Ventura or the Contractor, including those levied under the Federal Clean Water Act, State Fish & Wildlife Code, and the State Porter-Cologne Water Quality Control Act, by governmental agencies or as a result of citizen suits. Penalties shall also include payments made or costs incurred due to stop work orders, work suspension, scheduled days, and/or Contractor delays or in settlement for alleged violations of the Permit, or applicable laws, regulations, or requirements. Costs incurred could include sums spent instead of penalties, due to agency or County imposed mitigation or to remediate or correct violations, or damages resulting from stop work orders, work suspension, or scheduled days.

102-1.3 Retention of funds. Notwithstanding any other remedies authorized by law, the Ventura County may retain money due the Contractor under the contract, in an amount determined by Ventura County, up to and including the entire amount of Penalties proposed, assessed, or levied as a result of the Contractor's violation of the Permit, or Federal, State, or local law, regulations or requirements. Funds may be retained by the Ventura County until final disposition has been made as to the Penalties. The Contractor shall remain liable for the full amount of Penalties until such time as they are finally resolved with the entity seeking the Penalties.

Retention of funds for failure to conform to the provisions in this section, "Water Pollution Control," shall be in addition to the other retention amounts required by the contract. The amounts retained for the Contractor's failure to conform to provisions in this section will be released for payment on the next monthly estimate for partial payment following the date when an approved SWPPP has been implemented and maintained, and when water pollution has been adequately controlled, as determined by the RPR.

When the County or a regulatory agency identifies a failure to comply with the Permit and modifications thereto, or other Federal, State, or local requirements, the County will retain money due the Contractor, in the amount of 10 percent of the work done to date or any fine whichever is greater. This amount is in addition to the retention specified in Partial and Final Payment, subject to the following: the County will give the Contractor written notice of the County's intent to retain funds from partial payments which may become due to the Contractor prior to recording of the Notice of Completion.

During the first estimate period that the Contractor fails to conform to the provisions in this section, "Water Pollution Control," the Ventura County may retain an amount equal to 25 percent of the estimated value of the contract work performed.

The Contractor shall notify the RPR immediately upon request from the regulatory agencies to enter, inspect, sample, monitor, or otherwise access the project site or the Contractor's records pertaining to water pollution control work. The Contractor and the Ventura County shall provide copies of correspondence, notices of violation, enforcement actions, or proposed fines by regulatory agencies to the requesting regulatory agency.

102-1.4 Stormwater Pollution Prevention Plan (SWPPP) Preparation, approval, and amendments. As part of the water pollution control work, a SWPPP is required for this contract. The SWPPP shall conform to the provisions in this section, "Water Pollution Control," the requirements of the Permit, and these special provisions. Upon the RPR's approval of the SWPPP, the SWPPP shall be considered to fulfill the provisions of the contract bid item "Prepare Stormwater Pollution Prevention Plan."

Approval shall not constitute a finding that the SWPPP complies with applicable requirements of the Permit, the Manuals and applicable Federal, State, and local laws, regulations, permits, and requirements, nor does approval supersede the requirements and provisions of these special provisions, the Permit, or any other Federal, State, or local regulations or permit in the event of a conflict.

The SWPPP shall address stormwater run-off and run-on for all disturbed and affected areas of construction, including temporary and permanent measures. The SWPPP submittal shall contain the complete SWPPP document, along with the following information identified separately:

(a) Latitude/longitude of project site

(b) Total project site size (acres)

(c) Total area to be disturbed (acres)

(d) Percent imperviousness before construction

(e) Percent imperviousness after construction

(f) Date construction will begin

(g) Date all grading will be complete

(h) Date project will be complete

(i) Risk Assessment including the R Factor Value, K Factor Value, LS Factor, site sediment risk factor, and Receiving Water Risk Factor.

(j) Name of receiving water and whether project site run-off drains directly, indirectly, or through the storm drain system.

(k) Name of QSD, QSD Certification Number, and QSD SMARTS user ID

(l) Name of QSP QSP Certification Number, and QSP SMARTS user ID

(m) Contractor's site contact person, and their title, phone, and email address

(n) Contractor's designated Data Submitter and their SMARTS user ID

The SWPPP submittal shall be provided to the RPR for review and approval. The Contractor will prepare a Notice of Intent (NOI), pay the fee, and submit the SWPPP electronically to the State Water Resources Control Board (State) website, entitled Stormwater Multi Application Reporting and Tracking System (SMARTS). For the purposes of the Permit, the County is the owner of the Permit and the County is the Legally Responsible Person (LRP). The LRP will retain authority for assigning the Approved Signatories and Data Submitters in SMARTS. The Contractor's QSP and/or QSD will be designated as Data Submitters in SMARTS, including the responsibilities thereof, as required by the Permit. The Contractor will submit to the State and obtain a certified NOI and Waste Discharge Identification Number (WDID) for the project. The Contractor will be responsible for paying the associated fees.

The Contractor shall submit the SWPPP to the RPR within the Mobilization Element. The Contractor shall submit three (3) copies of the draft SWPPP to the RPR. The RPR will have five (5) working days to review the SWPPP. If revisions are required, as determined by the RPR, the Contractor shall revise and resubmit the SWPPP within five (5) working days of receipt of the RPR's comments. The RPR will have five (5) working days to review the revisions. Upon the RPR's approval of the SWPPP, four (4) approved hard copies and one (1) electronic copy of the SWPPP shall be submitted to the RPR. The electronic copy shall contain files no more than 50 megabytes in size. The Contractor will upload the SWPPP to the State SMARTS website. No ground disturbing work shall occur until the NOI is complete and the SWPPP has been uploaded to the State website, and a WDID number is obtained. The RPR will notify the Contractor in writing when the process is complete which will allow ground disturbing work to begin. In the event the RPR fails to complete the reviews within the time allowed, and if, in the opinion of the RPR, completion of the work is delayed or interfered with by reason of the RPR's delay in completing the review, an extension of time will be granted, in the same manner as provided for in the Standard Specifications.

The SWPPP shall apply to the areas within or immediately outside of the right-of-way that are directly related to all construction activities including, but not limited to, material borrow or disposal areas, staging areas, storage yards, and access roads, including those on-site areas developed by the Contractor with third parties for use during the project.

The SWPPP shall incorporate water pollution control practices in the following categories:

(a) Soil stabilization.

(b) Sediment control.

(c) Wind erosion control.

(d) Tracking control.

(e) Non-stormwater management.

(f) Waste management and materials pollution control.

The Contractor shall develop a Water Pollution Control Schedule that describes the timing of grading or other work activities that could affect water pollution. The Water Pollution Control Schedule shall be updated by the Contractor to reflect changes in the Contractor's operations that would affect the necessary implementation of water pollution control practices.

Water pollution control practices include the "Minimum Requirements" and other Contractor-selected water pollution control practices from the "SWPPP" and the "Project-Specific Minimum Requirements."

The Contractor shall incorporate water pollution control practices into the SWPPP as defined in the CASQA or Caltrans handbooks. Water pollution control practices shall include Contractor-selected water pollution control practices and "Project-Specific Minimum Requirements."

The requirements described herein are considered minimum requirements to satisfy the Ventura County erosion control standards. Additional BMPs may be required to meet the requirements set forth in the SWPPP and the Permit. All BMPs shall be designed, installed, maintained, and otherwise managed pursuant to the provisions set forth in the California Department of Transportation (Caltrans) Stormwater Quality Handbook, Construction Site BMP Manual (latest edition) or the California Stormwater Quality Association (CASQA), California Stormwater BMP Handbook for Construction (latest edition). The Contractor and/or his preparer may recommend equivalent erosion control applications that provide equal

or better performance for consideration and approval by the RPR. Approval of the SWPPP by the RPR/County shall not relieve the Contractor of any liability for violations of State or Federal water pollution control laws, Clean Water Act, Porter-Cologne Water Quality Control Act, Federal Endangered Species Act, State Fish and Wildlife Code, and other applicable laws and regulations.

The Contractor shall prepare an amendment to the SWPPP as required by the Permit, such as when there is a change in construction activities or operations which may affect the discharge of pollutants to surface waters, ground waters, storm drain systems; when the Contractor's activities or operations violate a condition of the Permit; when there is a change in the schedule that affects the discharge of pollutants; when there is a change in the schedule that affects the Risk Level required by the Permit; or when directed by the RPR. Amendments shall identify additional water pollution control practices or revised operations, including those areas or operations not identified in the initially approved SWPPP. Amendments to the SWPPP shall be prepared and submitted for review and approval within the time required by the Permit and approved by the RPR, but in no case longer than the time specified for the initial submittal and review of the SWPPP. Approved amendments shall be submitted electronically to the RPR within 24 hours of approval. At a minimum, the SWPPP shall be amended annually as required by the Permit, and an electronic copy submitted to the RPR.

The Contractor shall keep one copy of the approved SWPPP and approved amendments at the project site. The SWPPP shall be made available upon request by a representative of the Regional Water Quality Control Board, State Water Resources Control Board, United States Environmental Protection Agency, or the County. Requests by the public shall be directed to the RPR.

The list below includes some of the items that might be required to meet the applicable requirements for water pollution control work required in the SWPPP. Refer to the Plans for specific details.

- Erosion Control (Temporary)
- Erosion Control (Permanent)
- Straw Mulch
- Geotextiles, Plastic Covers & Erosion Control Blankets/Mats
- Wood Mulching
- Earth Dikes/Drainage Swales & Lined Ditches
- Outlet Protection/Velocity Dissipation Devices
- Slope Drains
- Silt Fence
- Desilting Basin
- Sediment Trap
- Gravel Check Dam
- Fiber Rolls
- Temporary Stream Crossing
- Street Sweeping and Vacuuming
- Sandbag Barrier
- Straw Bale Barrier
- Storm Drain Inlet Protection
- Wind Erosion Control
- Stabilized Construction Entrance/Exit
- Stabilized Construction Roadway
- Entrance/Outlet Tire Wash
- Water Conservation Practices
- Dewatering Operations
- Paving and Grinding Operations
- Clear Water Diversion
- Illicit Connection/Illegal Discharge Detection and Reporting
- Liquid Waste Management
- Potable Water/Irrigation
- Vehicle and Equipment Cleaning
- Vehicle and Equipment Fueling
- Vehicle and Equipment Maintenance
- Material Delivery and Storage
- Material Use
- Stockpile Management
- Spill Prevention and Control
- Solid Waste Management
- Hazardous Waste Management
- Contaminated Soil Management
- Concrete Waste Management
- Sanitary/Septic Waste Management

102-1.5 SWPPP Implementation. If there is a discrepancy between the project Permit and these special provisions, the Permit language shall supersede. If there is a discrepancy between the SWPPP and these special provisions, the special provisions shall supersede. Unless otherwise specified, upon approval of

the SWPPP, the Contractor shall be responsible throughout the duration of the project for installing, constructing, inspecting, maintaining, replacing, removing, and disposing of temporary water pollution control practices; installing, constructing, inspecting, maintaining, and replacing permanent water pollution control practices specified in the SWPPP and in the amendments; and all reporting and monitoring. The duration of work includes that time period between initial mobilization to the site and acceptance of the work. Unless otherwise directed by the RPR, the Contractor's responsibility for SWPPP implementation shall continue throughout temporary suspensions of work. Requirements for installation, construction, inspection, reporting, monitoring, maintenance, replacement, removal, and disposal of water pollution control practices shall conform to the requirements in these special provisions and to project permits.

Installing, inspecting, and maintaining water-pollution control practices on areas outside the right-of-way (or designated work area) not specifically arranged and provided for by the Ventura County for the execution of this contract, will not be paid for.

If the Contractor or the RPR identifies a deficiency in the implementation of the approved SWPPP or amendments, the deficiency shall be corrected immediately unless requested by the Contractor and approved by the RPR in writing but shall be corrected prior to the onset of precipitation. If the Contractor fails to correct the identified deficiency by the date agreed or prior to the onset of precipitation, the project shall be in nonconformance with this section, "Water Pollution Control."

If the Contractor fails to conform to the provisions of this section, the RPR may order the suspension of construction operations and/or may hire a third party to correct the deficiency. All costs associated with such work will be deducted from the Contractor's retention.

Implementation of water pollution control practices may vary by season. These special provisions shall be followed for control practice selection of year-round, rainy season and non-rainy season water pollution control practices.

102-1.6 Year-Round Implementation Requirements. The Contractor shall have a year-round program for implementing, inspecting and maintaining water pollution control practices for wind erosion control, tracking control, non-stormwater management, and waste management and materials pollution control.

The National Weather Service weather forecast shall be monitored and used by the Contractor on a daily basis. These Specifications require that if 30 percent or greater precipitation is predicted, the necessary water pollution control practices shall be deployed prior to the onset of the precipitation. If there is less than a 30 percent chance of precipitation, the Contractor shall still be responsible for ensuring the project site does not result in a discharge of pollutants off-site. Regardless of the chances of precipitation, the Contractor shall allow adequate time to properly install all required BMPs prior to precipitation.

Disturbed soil areas shall be considered active whenever the soil disturbing activities have occurred, continue to occur, or will occur during the ensuing 14 days. Non-active areas shall be stabilized with water pollution control practice within 14 days of cessation of soil disturbing activities or prior to the onset of precipitation, whichever occurs first.

102-1.7 Maintenance. To ensure the proper implementation and functioning of water pollution control practices, the Contractor shall regularly inspect and maintain the construction site for the water pollution control practices identified in the SWPPP and as required by the Permit. The construction site shall be inspected by the Contractor as follows:

- **a.** Prior to a forecast storm.
- **b.** After a precipitation event which causes site runoff.
- **c.** At 24-hour intervals during extended precipitation events.
- **d.** Routinely, a minimum of once every week
- **e.** Quarterly throughout the year

The Contractor shall use a Stormwater Quality Construction Site Inspection Checklist approved by the RPR. One copy of each site inspection record shall be submitted to the RPR within 48 hours of completing the inspection.

102-1.8 Reporting and Monitoring Requirements. All reporting and monitoring efforts required by the Permit are the responsibility of the Contractor. Such activities include but are not limited to preparation and implementation of the Rain Event Action Plans (REAP), Annual Reports, water sampling, and storm event monitoring and reporting. Reports shall be uploaded to SMARTS as required by the Permit. Annual Reports shall be completed in SMARTS and the RPR notified when complete. The County will review and certify the Annual Report. The County will complete the Notice of Termination (NOT) upon completion of the project and after the project site is stabilized and protected from erosion. All Annual Reports must be completed and approved by the State prior to approval of the NOT.

If the Contractor identifies discharges from the project site, regardless of source, in a manner causing, or potentially causing, a condition of pollution in surface waters or drainage systems, the Contractor shall immediately inform the RPR. In addition, the Contractor shall submit a written Notice of Discharge report to the RPR within 24 hours of the discharge event. The report shall include the following information:

a. The date, time, location, nature of the operation, and type of discharge, including the cause or nature of the notice or order.

b. The water pollution control practices deployed before the discharge event.

c. The date of deployment and type of water pollution control practices deployed after the discharge event, including additional measures installed or planned to remediate and clean-up the discharge, and/or reduce or prevent reoccurrence.

d. An implementation and maintenance schedule for affected water pollution control practices.

102-1.9 Report of First-Time Non-Stormwater Discharge. The Contractor shall notify the RPR at least 3 days in advance of first-time non-stormwater discharge events, excluding exempted discharges. The Contractor shall notify the RPR of the operations causing non-stormwater discharges and shall obtain field approval for first-time non-stormwater discharges. Non-stormwater discharges shall be monitored at first-time occurrences and routinely thereafter.

If the Contractor receives a written Notice, Order, or other non-compliance action letter from a regulatory agency as a result of stormwater or other discharges from the project site, the Contractor shall immediately notify the RPR. The Contractor shall be solely responsible for responding to and complying with the Notice, Order, or action letter, unless otherwise directed by the RPR.

The Contractor shall be responsible for submitting complete, accurate, and detailed reporting documents sufficient to satisfy all conditions of the Permit and regulatory agency requirements.

BASIS OF PAYMENT

102-3.1 The contract lump sum price paid for "Compliance with Pollution, Erosion, and Siltation Control" shall include full compensation for preparation and implementation of the Stormwater Pollution Prevention Plan.

Preparation of the SWPPP shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals for doing all the work involved in developing, preparing, obtaining approval of, revising and amending the SWPPP as specified herein, and as directed by the RPR, and any fees associated with this item.

No additional payment will be made to correct deficiencies in the approved SWPPP or Amendments.

Implementation of the SWPPP shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in implementing the SWPPP, installing, constructing, removing, and disposing of water pollution control practices, including non-stormwater management, and waste management and materials for water pollution control practices as provided for in the approved SWPPP, except those for which there is a contract item of work as specified in the Standard Specifications and these special provisions, and as directed by the RPR.

Full compensation for Permit reporting and compliance, including all monitoring, preparation of inspection reports, and stormwater sampling and analysis, and maintenance costs of Water Pollution Control

Practices, Amendments, and Implementation of Amendments as specified in this section, "Water Pollution Control", shall be considered as included in the contract lump sum price and no additional compensation will be allowed therefor.

No additional payment will be made for Water Pollution Control Practices necessary to correct deficiencies in the approved SWPPP or Amendments.

Water pollution control practices for which there is a contract item of work, will be measured and paid for as that contract item of work

Payments for "Compliance with Pollution, Erosion, and Siltation Control" will be made as follows:

a. Monthly progress payments for “Compliance with Pollution, Erosion, and Siltation Control" will be paid at the RPR's discretion will be based on the monthly project completion percentage.

b. The proposed final estimate payment will include the final balance of payment for this item of work.

Payment will be made under:

Item SP-102-3.1 Compliance with Pollution, Erosion, and Siltation Control – per lump sum

END OF ITEM SP-102A

Item SP-106 Key Personnel

106-1.1 Overview. This Project Requirement identifies Key Personnel required for the successful project completion, provides for the minimum qualifications for the Contractor's Key Personnel, and outlines the process for replacing Key Personnel.

If a member of the Key Personnel either resigns or becomes physically or mentally incapable of performing the duties required of the position, the Contractor shall be permitted to propose the résumés of candidates with equal or higher qualifications for review by and approval of the Resident Project Representative (RPR) to maintain continuity of services. Should the services of any Key Personnel no longer become available to the Contractor for the reasons cited above, the Contractor shall submit to the RPR for approval as soon as possible, but in no event later than seven (7) calendar days, prior to the departure of the incumbent Key Personnel. The proposed Key Personnel candidate shall be accepted or rejected based on the sole judgement of the RPR.

If, for any reason other than those cited above (for example, the Contractor removes a Key Personnel member to another project or for its own convenience), the RPR shall have the right to enforce liquidated damages as specified below. Furthermore, the RPR shall retain the sole right to accept or reject the proposed replacement candidate. The RPR approved Key Personnel replacement shall be subject to the same retention requirement of the originally approved Key Personnel and any further removal shall be subject to RPR approval and potential enforcement of liquidated damages.

The RPR shall have the right to request removal of any Key Personnel by providing timely and written notice to the Contractor.

106-1.2 Key Personnel. The Contractor was selected, in part, on the basis of the qualifications of the Key Personnel submitted by the Contractor during the bid submittal and selection process. Continuity and job familiarity of the Contractor's Key Personnel are considered to be critical factors for the successful and timely completion of the Work. Therefore, the Contractor is required to retain the Key Personnel on a full-time basis throughout the duration of the Project.

The positions listed below are designated as the Contractor's Key Personnel for this contract.

1. Contractor's Representative (Project Manager)
2. Project Superintendent
3. Asphalt Paving Superintendent
4. Airfield Electrical Superintendent
5. Quality Control (QC) Manager
6. Project Scheduler
7. Safety Manager

In order to communicate with the RPR, the Contractor's representative, superintendent, or person in charge of specific work shall be able to speak, read, and write fluently in the English language.

The RPR reserves the right to:

1. Disapprove any candidate named as the Contractor's Key Personnel or alternates who fail to meet the provisions set forth herein.
2. Remove, without any right to work on the Project, either the Contractor's Key Personnel or alternate, who in the sole opinion of RPR has demonstrated incompetence, lack of ability, or other unsuitability to perform supervision of the work; and that individual shall not, without permission of RPR, be re-employed on the Project.

a. Contractor's Representative (Project Manager). As part of the bid submittal process, the Contractor, even if a joint venture, shall designate in writing one (1) representative who shall have complete authority to act for it and who shall have experience in the executive management of at least one complete project of similar scope, value and complexity, and using a substantially similar project delivery model. Contractor's Representative (Project Manager) shall be full time employee of the Contractor and have a minimum of ten (10) years construction experience, including at least five (5) years of experience in airport or general construction on projects of comparable size and scope as this contract. Contractor's Representative shall be dedicated to this project and shall be on-site on a full-time basis and may not manage or be responsible for any other construction project.

An alternative representative, meeting the minimum qualifications above, may be designated as well. The representative or alternate shall be present at the Project Site whenever work is in progress or whenever it is necessary to take measures to protect the work, persons, or property. Any order of communication given by the RPR to this representative shall be deemed delivered to the Contractor. In the absence of the Contractor's representative, instruction or directions shall be given by the RPR to the Contractor's Project Superintendent or person in charge of the specific work to which the order applies. Such order shall be complied with promptly and referred to the Contractor or its representative.

Failure to have the Contractor's representative or alternate representative present at the Project Site at all times while work under the Contract is in progress shall, at RPR's sole discretion, constitute suspension of the Work by the Contractor, until such time as said individual(s) is (are) again present at the Project Site.

No payment or any extension of time will be allowed for any work performed in the absence of the Contractor's Representative or alternate.

b. Project Superintendent. As part of the bid submittal process, the Contractor shall designate in writing one (1) project superintendent who shall have authority to direct the work in the field for all prime and sub-contractor work. Contractor's Project Superintendent shall be a full-time employee of the Contractor and have a minimum of ten (10) years construction experience including at least five (5) years of experience in airport or general construction projects of comparable size and scope as this contract. Contractor's Project Superintendent shall be dedicated to this project and shall be on-site on a full-time basis and may not manage or be responsible for any other construction projects.

An alternative project superintendent, meeting the minimum qualifications above, may be designated as well. The Project Superintendent or alternate shall be present at the Project Site whenever work is in progress or whenever it is necessary to take measures to protect the work, persons, or property. In the absence of the Contractor's Representative, instructions or direction shall be given by the RPR to the Contractor's Project Superintendent or person in charge of the specific work to which the order applies. Such order shall be complied with promptly and referred to the Contractor or its representative.

Failure to have the Contractor's Project Superintendent or alternate representative present at the Project Site at all times while work under the Contract is in progress shall, at RPR's sole discretion, constitute suspension of the Work by the Contractor, until such time as said individual(s) is (are) again present at the Project Site.

No payment or any extension of time will be allowed for any work performed in the absence of the Contractor's Project Superintendent or alternate.

c. Asphalt Paving Superintendent. As part of the bid submittal process, the Contractor shall designate in writing one (1) Asphalt Paving Superintendent who shall have authority to direct and coordinate all paving work. The Contractor's Asphalt Paving Superintendent shall be a full-time employee of the Contractor or sub-contractor and have a minimum of ten (10) years construction experience, including at least five (5) years of experience in airport or general construction on projects of comparable size and scope as this contract. Contractor's Asphalt Paving Superintendent shall be dedicated to this project and shall be on-site on a full-time basis during asphalt paving work.

An alternative Asphalt Paving Superintendent, meeting the minimum qualifications above, may be designated as well. The Asphalt Paving Superintendent or alternate shall be present at the Project Site whenever asphalt paving work is in progress or whenever it is necessary to take measures to protect the asphalt paving work, persons, or property. In the absence of the Project Superintendent, instructions or direction shall be given by the RPR to the Contractor's Asphalt Paving Superintendent or person in charge of the asphalt paving work. Such order shall be complied with promptly and referred to the Contractor or its representative.

Failure to have the Contractor's Asphalt Paving Superintendent or alternate representative present at the Project Site during asphalt paving work under the Contract is in progress shall at RPR's sole discretion constitute suspension of the Work by the Contractor, until such time as said individual(s) is (are) again present at the Project Site.

d. Airfield Electrical Superintendent. As part of the bid submittal process, the Contractor shall designate in writing one (1) Airfield Electrical Superintendent who shall have authority to direct and coordinate all electrical work. Contractor's Airfield Electrical Superintendent shall be a full-time employee of the Contractor or sub-contractor and have a minimum of ten (10) years construction experience, including at least five (5) years of experience in airport or general construction on projects of comparable size and scope as this contract. The Contractor's Airfield Electrical Superintendent shall be dedicated to this project and shall be on-site on a full-time basis during airfield electrical work.

An alternative Airfield Electrical Superintendent, meeting the minimum qualifications above, may be designated as well. The Airfield Electrical Superintendent or alternate shall be present at the Project Site whenever airfield electrical work is in progress or whenever it is necessary to take measures to protect the electrical work, persons, or property. In the absence of the Project Superintendent, instructions or direction shall be given by the RPR to the Contractor's Airfield Electrical Superintendent or person in charge of the airfield electrical work. Such order shall be complied with promptly and referred to the Contractor or its representative.

Failure to have the Contractor's Airfield Electrical Superintendent or alternate representative present at the Project Site during airfield electrical work under the Contract is in progress shall at RPR's sole discretion constitute suspension of the Work by the Contractor, until such time as said individual(s) is (are) again present at the Project Site.

e. Quality Control (QC) Manager. As part of the bid submittal process, the Contractor shall designate in writing one (1) QC Manager who shall administer the Construction Quality Control Program and shall be a full-time employee of the Independent Inspection and/or Testing Company. The Contractor's QC Manager shall have a minimum of ten (10) years construction experience, including at least five (5) years of recent experience in airport or general construction on projects of comparable size and scope as this contract. Contractor's QC Manager shall be dedicated to this project and shall be on-site during QC activities.

An alternative QC Manager may be designated as well. The QC Manager or alternate shall be present at the Project Site whenever work is in progress or whenever it is necessary to take

measures to protect the work, persons, or property. In the absence of the Project Superintendent, instructions or direction shall be given by the RPR to the Contractor's QC Manager or person in charge of the Quality Control Program. Such order shall be complied with promptly and referred to the Contractor or its representative.

Failure to have the Contractor's QC Manager or alternate representative present at the Project Site while work under the Contract is in progress shall at RPR's sole discretion constitute suspension of the Work by the Contractor, until such time as said individual(s) is(are) again present at the Project Site.

f. Project Scheduler. As part of the bid submittal process, the Contractor shall designate in writing one (1) Project Scheduler who shall prepare and maintain the Project Construction Schedule throughout the duration of the Project. Contractor's Project Scheduler shall have a minimum of ten (10) years construction experience, including at least five (5) years of recent experience in airport or general construction on projects of comparable size and scope as this contract. The Contractor's Project Scheduler shall be dedicated to this project. Additional Project Schedulers may be designated as well.

106-1.3 Replacing Key Personnel. If the Contractor's representative or alternate leaves the employ of the Contractor, the Contractor will be required to replace the individual(s) within fifteen (15) days and to fulfill the requirements of this Subsection. In the interim, an "Acting Representative" for each key position described above must be named by the Contractor.

Failure of the Contractor to maintain key personnel will result in damages being sustained by Ventura County. The Contractor shall pay to Ventura County for each key personnel removed from the project without RPR approval the amount of Liquidated Damages as listed in the table of Liquidated Damages below:

Key Personnel	Amount (per event)
Project Manager	$50,000
Project Superintendent	$50,000
Asphalt Paving Superintendent	$25,000
Airfield Electrical Superintendent	$25,000
Quality Control Manager	$25,000
Project Scheduler	$10,000

METHOD OF MEASUREMENT

No separate payment will be made as part of this Project Requirement. Therefore, no method of measurement is required.

BASIS OF PAYMENT

No separate payment will be made as part of this Project Requirement. The information provided will be used to evaluate the bidder's responsiveness.

END OF ITEM SP-106

SP-107 Scheduling of the Work

107-1.1 Overview. The scheduling and execution of the work in accordance with the contract documents are the responsibility of the contractor. Schedules shall represent a practical plan to complete the Work within the work completion time and shall convey the contractor's intent in the manner of prosecution and progress of the Work. Schedules shall be created using scheduling software appropriate for the work, subject to acceptance or approval by the Resident Project Representative (RPR) as described herein. The submittal of schedules shall be understood to be the contractor's representation that the schedule meets the requirements of the contract documents and that the work will be executed in the sequence and duration indicated in the schedule.

107-1.2 Construction Schedule and Progress Schedule. A construction schedule and progress schedule shall be submitted to the RPR by the Contractor within five (5) working days prior to the preconstruction meeting. An Agency-approved schedule will be required prior to issuing a Notice to Proceed with the Construction Element.

Schedule shall be a Critical Path Method Baseline type. Schedule shall indicate complete sequence of each construction category, indicating a time bar for each major category or unit of work to be performed. Work shall be properly sequenced and indicate being fully completed within the scheduled time of completion or substantial completion.

Schedule shall be coordinated with all other Contractors, subcontractors, and material suppliers prior to submission. Contractor shall update the schedule for each weekly construction meeting or whenever there is a significant change in progress, whether in a particular phase or total job progress.

Progress schedule shall incorporate submittals, product data, and sample submissions. Schedule shall indicate preparation time, approval time, resubmissions, fabrications, delivery dates and installation time.

Prior to the contractor's Notice to Proceed, the following events need to occur. Anticipated dates for these actions are as follows:

Bid Opening: 4/29/2021
Recommendation of Award: 5/12/2021
Submission of Revised Grant Amount to FAA: 5/14/2021
County Receipt and Execution of Grant: 5/28/2021
Execution of Construction Contract: 5/31/2021
Submission of Caltrans Grant Application: 6/3/2021
County Issue of NTP for Mobilization Phase 1: 6/14/2021
NTP for Mobilization Phase 2 and Construction: 6/28/2021

The above dates are an estimated schedule. If delay of the FAA grant does not permit construction Phase 1 completion by November 1, 2021, the Project may not start until 2022 to avoid a suspension of work with an unusable runway.

Contractor shall submit a draft Critical Path Method Schedule with their bid for award type using the Project elements identified on the CSPP.

1. Base Bid (Schedule A) + Base Bid Transition (Schedule B)
2. Base Bid (Schedule A) + Bid Alternate 1 (Schedule C) + Bid Alternate 1 Transition (Schedule D)
3. Base Bid (Schedule A) + Bid Alternate 1 (Schedule C) + Bid Alternate 2 (Schedule E)

107-1.3 General Schedule Requirements.

1. Schedules shall be consistent with the time and work requirements of the Contract. Contractor shall execute the Work in the sequence indicated on the current approved schedule to permit the RPR to schedule its resources, inspections, consultants, and any other work accordingly. The RPR may, in

its discretion, require that schedules and plan construction over the entire Work Completion Time be adhered to and that the Contractor shall have no claims if the RPR disallows the Contractor from finishing early.

2. The Contractor shall involve and coordinate with all subcontractors, third parties, and material suppliers in the development and updating of schedules.
3. Review, acceptance or approval of schedules by RPR shall not waive any contract requirements and shall not relieve the Contractor of any obligation or responsibility for submitting complete and accurate information.
4. If, after a schedule has been accepted or approved by the RPR, either the Contractor or RPR discovers that any aspect of the schedule has an error or omission, Contractor shall correct it on the next progress schedule.
5. Errors or omissions on schedules shall not relieve the Contractor from finishing all work within the Work Completion Time.
6. The Contractor shall adjust, add to, or clarify any portion of a schedule which the RPR determines to be insufficient for monitoring the Work or to be impractical for any reason.
7. Use of float suppression techniques such as preferential sequencing or logic, special lead/lag logic restraints and extended activity durations will be cause for rejection of schedule submittal.
8. The Construction Scheduler is required to be completely familiar with the contract and have first-hand knowledge of the Work from on-site periodic job walks and shall attend all meetings pertaining to scheduling and progress of Work, including weekly jobsite meeting as requested by the County.
9. The scheduling method to be used shall be a Critical Path Method schedule in the form of an activity on node Precedence Diagram Network (PDN) with capabilities of identifying the critical path and controlling operation. The principles and definitions of the terms used herein shall be as set forth in the Associated General Contractors of America (AGC) publication “Construction Planning and Scheduling,” latest edition. To the extent there are any conflicts between the AGC publication and the Contract Documents, the Contract Documents shall govern.
10. The Schedule shall include activities, regardless of responsibility, that directly or indirectly relate to or have influence over planning and executing the scope of work in strict accordance with the contract documents, and shall include but not be limited to Engineering, procurement, the Contractor’s submittals and their forecast approval dates, fabrication, shipment and deliveries of material and equipment (by the Contractor and by others), and all on-site activities including quality control, testing, training and the turnover of final reports, Operations and Maintenance Manuals, and as-built drawings.
11. It is expressly understood and agreed that the time of the beginning, the rate of progress, the interim Contract Milestones, and the time of the completion of the Work are of the essence to this Contract. The Work shall be executed with such progress as required to prevent any delay to other Contractors working on other contracts at Ventura County Airports and the general completion of the Contract.
    a. The Contractor has a contractual duty to take reasonable remedial action, in the most economical manner, to mitigate any and all delays to any milestone or the completion date.
    b. In all cases, when it is possible for the Contractor to eliminate the time impact of a delay without added cost to itself, the Contractor shall do so and shall not be entitled for a time extension under such circumstances.
    c. The Schedule shall be prepared to include the completion date for the total Contract and the critical path shall be identified, including critical paths for interim milestone dates. Scheduled start or completion dates for activities imposed on the schedule by the Contractor shall be consistent with the Contract milestone dates. Milestone events shall be the schedule dates specified in the Contract and shall be prominently identified and connected to the appropriate element of the Work, denoting its start or completion.

107-1.4 Contractor's Project Scheduler.

1. The Project Scheduler is required to attend all meetings pertaining to scheduling and progress of the Work, including weekly job meetings. The Project Scheduler shall be available full time and, at the request of RPR, be available for any schedule related meeting. Failure to be available full time will constitute reason for termination of the Project Scheduler. If the Project Scheduler leaves the employ of the Contractor, the Contractor is required to fulfill the requirements of this subsection within thirty (30) days of the departure of the Contractor's Project Scheduler.
2. The number of schedulers required for timely completion of schedule deliverables will be determined by the Contractor. Any additional schedulers needed shall be hired by the Contractor to ensure all scheduled deliverables are submitted on time.

107-1.5 Baseline Schedule Requirements.

1. The Contractor's Baseline Project Schedule shall show all Work and the sequence of all activities needed for the orderly performance and completion of all Work. The schedule shall reflect the Contractor's true plans for performing the Work. The Contractor shall be responsible for the means, methods, and duration. The Contractor's Baseline Project Schedule shall strictly follow all stage and/or phasing requirements as identified in the contract, engineering and construction phasing documents provided for reference. Any schedule showing a project completion duration other than that allowed in the Contract will not be approved.
2. The Contractor shall provide a written narrative accompanying the electronic version of the Contractor's Baseline Project Schedule submission. This narrative shall explain the Contractor's approach for meeting all milestones and project completion dates. It shall also include a clear description of the critical path activities from beginning to end and describe anticipated crew sizes, production rate, equipment requirements and anticipated problems of major activities along the critical path.
3. In the written narrative, the Contractor shall include the basis and assumptions (including activity duration basis), Critical Path analysis, historic project comparisons, and productivity and installation rates used to develop the Project Schedule. The Contractor shall include management staffing, non-manual and manual labor for engineering and construction, construction crew sizes, equipment requirements, and anticipated delivery dates; restraints; critical path activities; activities requiring overtime or additional shifts; activities that contain time contingencies for impacts to be expected from normal rainfall; holidays and other non-work calendar days; potential problem areas; permits; coordination required with Ventura County and third party agencies; and long lead delivery items requiring more than thirty (30) days from order to delivery.
4. A list of activities, showing the early and late start and finishes, duration, total float responsibility code, and predecessor and successor relationship, sorted by early start.
5. Non-manual labor staffing plan by department/position showing start and finish date (month and year) and number of each position per month. Include histograms showing staffing (incremental by month and cumulative) over the life of the Contract in terms of both headcount and job hours.
6. Manual labor staffing plan by craft (including Subcontractors) showing start and finish date (month and year) and number of craft per month. Include histograms showing staffing (incremental by month and cumulative) over the life of the Contract in terms of both headcount and job hours.
7. Activity durations shall be the total number of actual calendar days required to perform that activity including consideration of normal weather impact on completion of that activity. The activities included in the Contractor's Baseline Project Schedule shall be analyzed in detail to determine activity time durations in units of calendar days. Durations shall be based on anticipated production rates for labor (crafts), equipment and materials required to perform each activity on a normal workday basis.
8. The first activity in the Baseline Schedule shall represent the Notice to Proceed as a milestone and the data date of the Baseline Schedule shall be the Contract "Notice to Proceed" date.

9. Include at least one (1) predecessor and one (1) successor for each activity excluding the project start and finish milestones.
10. Define one calendar to include the Holidays listed under County of Ventura Standard Specifications. No activity impacting Airport Operations shall be performed on these days without written approval by RPR.
11. The Baseline Schedule shall not contain negative total float or negative lag for any activity.
12. The Critical Path and number of critical activities shall be no more than thirty percent (30%) of the total activities in the Contractor's Baseline Project Schedule.
13. The Project's Critical Path, for the purpose of acceptance of all schedule submittals, shall be determined by the longest path analysis.
14. All durations shall be the result of definitive labor and resource planning by the Contractor to perform the Work according to the Contract Documents. The labor to be assigned by craft, definition, equipment, and bid item designation shall be shown for each construction activity for the network on a tabular listing. All crafts necessary to execute an activity must be shown. No more than one (1) subcontractor may be assigned to a specific activity. If more crafts are required, then the activity in question must be broken down into additional activities.
15. Retained Logic shall be the method of calculation and the "Retained Logic" setting shall be used.
16. All Activity Names shall be clearly and uniquely named with a description of work readily identifiable to inspection staff. Each Activity shall have a narrative description consisting at a minimum of one verb or work function (i.e. form, pour, excavate, review, approved, cure, etc.), an object (i.e. slab, footing, wall, shop drawing, submittal, girder, etc.) and a location.
17. The RPR reserves the right to require that the Contractor modify, adjust, add to, or clarify any portion of the Project Baseline or Progress Schedule which may later be discovered to be insufficient or inaccurate for planning, monitoring or prosecuting the Work (Schedule Adjustments). The first of each type of schedule or schedule report submitted by the Contractor will be reviewed for format, as well as content. Once the format has been approved all subsequent Project schedules shall be submitted in the approved format. RPR may request format changes as the Contract progresses. No additional compensation shall be provided for such modifications, adjustments, additions, or clarifications.
18. Lags shall be used at a minimum and shall not exceed ten (10) days in duration. A lag report will identify all lags used in the Baseline Schedule and a specific reason for its use will be provided for each. If it is determined that an activity or activities may take the place of the lag, RPR reserves the right to request the activity be used in its place. Failure to do so may constitute grounds for rejection of the baseline.
19. Early Completion: The Contractor may submit a Baseline or Progress Schedule showing an early scheduled completion date provided that the requirements of the Contract are met.
    a. The difference between the early completion date and the Work Completion Time is considered float. Float time shall not be for the exclusive benefit of either the Owner or the Contractor. Float shall be a resource available to both parties.
    b. Ventura County is not required to accept or approve a schedule with an early completion date.
    c. Contractor shall not be entitled to extra compensation in the event an agreement is reached on an early completion date and Contractor completes the Work, regardless of the reason, beyond the early completion date but within the Work Completion time.
20. A Calendar report shall be included with the Baseline Schedule Submittal. All calendars whether workday, seven-day, six-day, etc. shall have a basis of an eight (8) hour shift unless otherwise needed. Any calendar using more than an eight (8) hour shift shall be called out in the calendar report and a narrative explanation provided. The global calendar shall be seven (7) day / twenty-four (24) hour without any holidays or non-workdays.
21. In the case where construction crews experience adverse weather, the Contractor shall provide the RPR with a written request notice within three (3) days for any request for a time extension

associated with adverse weather. Such delays must be clearly indicated by a fifty percent (50%) decrease in the field labor workforce hours on critical path activities on the day in question, as indicated by the Contractor's Daily reports from the day in question and the scheduled work days prior to the day in question.

a. Inclement weather on non-scheduled work days shall not be granted as weather impact days. If the effects of inclement weather from a non-scheduled work day carry forward to a scheduled work day and impacts the Critical Path as noted above, then the scheduled work day will be considered impacted by adverse weather.
b. All impacts occurring with regard to RPR approved adverse weather days will be a non-compensable time extension and may be granted pursuant to the contract documents as non-compensable to the Contractor.

22. The detailed breakdown of Project schedule activities may include:
    a. Type of Work to be performed, the sequences, and the labor trades involved and RPR approved WBS.
    b. All purchase, submittal, submittal review and necessary re-review, manufacturing, test, installation activities for all major materials and equipment, and a separate list of all major material items or items of equipment for which the Contractor intends to seek payment prior to installation.
    c. Preparation, submittal, and approval of shop and/or working drawings, and material samples showing the minimum timeframes for RPR's review of all submittals, or longer as identified in the Contract.
    d. Resource loading for cost, labor, material, and equipment. Include craft man-hours that add up to the total number of man-hours in the Contractor's estimate, quantities of materials that reconcile with the "Contract Pricing."
    e. All start up, testing, training, and assistance required under the Contract. (e.g. Punch list and final clean up).
    f. Identification of any labor, material, or equipment restrictions, as well as any activity requiring unusual shift Work.
    g. No activity shall have a duration over fourteen (14) days except non-construction activities such as submittals, submittal reviews, procurement and delivery of materials or equipment, and concrete curing without approval from RPR.
    h. All construction activities shall be shown in their resource-loaded state to reflect labor, materials and equipment. All durations shall be the result of definitive labor and resource planning by the Contractor to perform the Work according to the Contract Documents.
    i. Cost-Loading: Cost loading shall be made to all activities associated with all Contract Items identified in the "Contract Pricing" and sum of the total cost-loaded in the schedule shall equal the Total Contract Amount. The total cost-loading for all activities for a given Lump Sum Contract Item shall equal the bid amount listed in the "Contract Pricing."
    j. All construction activities shall be loaded with all resources required for the prosecution of the activity. These resources shall include labor, materials and equipment.
    k. Manpower availability shall not be allowed to drive the critical path at the sole discretion of the Contractor. Manpower limitations must be verifiable in writing by the Union's business agent before such resource-driven logic is incorporated into the Contractor's Baseline Project Schedule.
    l. All major equipment valued over $100,000 in capital cost to be used shall be identified in the Contractor's Baseline Project Schedule either as a resource or as a 'Level of Effort' (LOE) activity.
    m. Float or slack time is not for the exclusive use or benefit of Ventura County or the Contractor but is an expiring resource available to all parties as needed to meet the Contract Completion Date.
    n. Pursuant to the float-sharing requirements of the Contract, use of float suppression techniques such as preferential sequencing, special lead/lag logic restraints, extended activity times or

imposed dates (mandatory Constraints) break the CPM rules and shall be cause for rejection of the Contractor's Baseline Project Schedule and any revisions or updates. The use of "Start On or after" or "Start On or before" and "Finish On or after" or "Finish On or before" will be allowed. The use of float time disclosed or implied by the use of alternative float suppression techniques shall be shared as directed by RPR.

o. Contractor shall use base calendars which are appropriate with the work being performed. These should be tied into the requirements and restrictions of airport operations. Multiple calendars are acceptable for the Schedule.

p. The timeframe for third party (e.g. County, FAA, and Engineer of Record) submittal review should be identified in the Contractor's Baseline Project Schedule. Third party reviews may require additional time beyond the standard review period allowed for RPR Review. If necessary, additional time will be given to County and FAA.

23. Submit with the baseline schedule, a statement on subcontractor's letterhead, certifying that subcontractor has reviewed and concurs with the baseline schedule and that subcontractor's related schedule has been reasonably incorporated, including activity duration.

METHOD OF MEASUREMENT

107-2.1 Scheduling of the Work, and all incidentals required to complete work described in this section will not be separately measured, and no payment shall be made.

BASIS OF PAYMENT

107-3.1 Scheduling of the Work shall be considered incidental and no separate payment shall be made.

END OF ITEM SP-107

Item SP-108 Partnering

108-1.1 Overview. It is Ventura County's intention to use a formal Partnering process on this project. The Contractor, their key subcontractors, designer and material suppliers, to the extent they are known, will be requested to attend an Executive Partnering Committee Workshop prior to the commencement of work on the project, and follow up Partnering Workshops. In these workshops, mechanisms will be developed to achieve extraordinary project success, mitigate and prevent disputes, and help create a collaborative team environment. Partnering is intended to establish an environment of cooperation between the parties and will affect the terms of the contract.

108-1.2 Executive Partnering Committee. The Executive Partnering Committee will be comprised of the Airport Director, Airport Project Manager, Engineer of Record, Resident Project Representative, Contractor's Representative Project Manager, and Contractor's Principal or similar position. The Executive Partnering Committee is responsible for developing a Project Partnering Charter.

108-1.3 Project Partnering Charter. The Project Partnering Charter will identify Key Personnel from all parties who will participate in all Partnering activities, develop mechanisms for resolving project challenges, develop a conflict resolution hierarchy, and establish schedule for Partnering Workshops to evaluate the Project Team's progress towards achieving stated goals.

108-1.4 Project Team. The Project Team will be comprised of Key Personnel from Airport Representatives, Contractor and Subcontractors, Construction Management, and Engineering Team. The Project Team will be empowered to set project objectives, identify challenges to reaching project objectives, propose and evaluate solutions to identified challenges, and arrive at preferred solutions that are in the best interest of the project.

108-1.5 Partnering Workshops. There will be a one to two-day workshop before the start of construction. The Executive Partnering Committee will meet first and the Project Team will meet after on the same day or following day. There will be an additional meeting in the middle of the construction to assess the Project Team's progress towards achieving stated goals and identify opportunities to improve project performance.

108-1.6 Professional Partnering Facilitator. The Contractor shall hire and pay for a third-party professional facilitator as designated by Ventura County.

METHOD OF MEASUREMENT

108-2.1 No separate measurement for payment shall be made for Project Partnering and Third-Party Facilitator. It shall be considered necessary and incidental to the work of this Contract.

BASIS OF PAYMENT

108-3.1 No payment will be made separately or directly for Project Partnering and/or a Third-Party Facilitator. Project Partnering and a Third-Party Facilitator shall be considered necessary and incidental to the work of this Contract.

END OF ITEM SP-108

Item SP-126 Removing Miscellaneous Structures

DESCRIPTION

126-1.1 This Work generally consists of removal and salvage or disposal of: concrete gutter, abandoned waterline, airport edge lighting, airfield guidance signs and foundations, base cans, junction boxes, cable and encountered conduit, and associated appurtenances.

CONSTRUCTION METHODS

126-2.1 Remove REILs and Demolish PCC Foundation. Remove and salvage to owner existing REILs as shown on the Plans. Removal shall include removal of REIL fixtures and equipment for reuse, and demolition of existing PCC foundations with reinforcement. Debris resulting from the removals shall become property of the Contractor and shall be removed and disposed of off-site. Demolition debris shall not be used for fill or backfill. Fixtures and transformers shall be removed and salvaged for reinstallation.

126-2.2 Demolish Conduit, Cable, and Counterpoise. The Contractor shall remove existing and abandoned cable(s) from conduit, counterpoise inside and outside of conduit, and/or manholes as indicated in the Plans; and shall remove and plug any encountered conduit during execution of the work. Due to the phasing contained in the project, removal of cabling from a conduit may occur multiple times for the same conduit. The removal of cabling from a conduit will only be considered once per conduit, regardless of the amount of times cabling is removed from the conduit. In some instances, identification of cables needing to be removed along with all other cables routed in the same duct, handhole, manhole, or junction can will be required. All removed materials shall become property of the Contractor and be disposed of off-site or placed in the staging area as directed by the RPR for a period of 30 days for Airport to determine salvageable items. Any items deemed not salvageable by the Airport will become the property of the Contractor and shall be disposed of offsite.

126-2.3 Remove Existing Cable and Counterpoise. The Contractor shall remove existing and abandoned cable(s) from conduit, counterpoise inside and outside of conduit, and/or manholes as indicated in the Plans; existing conduit to remain and to be reused during execution of the work. Due to the phasing contained in the project, removal of cabling from a conduit may occur multiple times for the same conduit. The removal of cabling from a conduit will only be considered once per conduit, regardless of the amount of times cabling is removed from the conduit. In some instances, identification of cables needing to be removed along with all other cables routed in the same duct, handhole, manhole, or junction can will be required. Cables that are to remain shall be meggered prior to and after the removal of cable. Cables with lower megger results after cable removal shall be repaired or replaced until megger results are equal to or greater than the reading prior to cable removal. All removed materials shall become property of the Contractor and be disposed of off-site or placed in the staging area as directed by the RPR for a period of 30 days for Airport to determine salvageable items. Any items deemed not salvageable by the Airport will become the property of the Contractor and shall be disposed of offsite.

126-2.4 Remove and Salvage Unlit Information Sign. Remove and salvage existing sign. Protect existing pad, conduit, and cans in-place. Removal shall include removal of sign panels. Conductor to be demolished when slated for replacement. Debris resulting from the removals shall become property of the Contractor and shall be removed and disposed of off-site. Signs shall be salvaged and stockpiled as identified in the plans. If signs are not identified on the plans for reuse, the contractor shall indicate to the airport when salvaged items are stockpiled and allow the airport 30 days to salvage any items. Contractor shall dispose of any signs and transformers remaining after the 30-day salvage period identified in the plans.

126-2.5 Remove and Salvage Unlit Information Sign. Demolish Concrete Pad. For the sign, remove and salvage existing sign. Removal shall include removal of sign panels. Conductor to be demolished when slated for replacement. Debris resulting from the removals shall become property of the Contractor and shall be removed and disposed of off-site. Signs shall be salvaged and stockpiled as identified in the plans. If signs are not identified on the plans for reuse, the contractor shall indicate to the airport when salvaged

items are stockpiled and allow the airport 30 days to salvage any items. Contractor shall dispose of any signs and transformers remaining after the 30-day salvage period identified in the plans.

For the concrete pad, remove existing PCC sign pad. Removal shall include removal and disposal of existing concrete bases, wiring, encountered conduit, and any other items necessary for the complete removal of the item. All remove materials shall be removed and disposed of off-site. Excavations after removal shall be backfilled with material equal or better in quality than adjacent embankment. Excavated areas must be backfilled and compacted per Specification P-152.

126-2.6 Demolish Electrical Junction Can. Demolish the existing junction can. Removal shall include removal and disposal of existing concrete, bases, lids, wiring, encountered conduit, reconnection of conduit, and any other items necessary for the complete removal of the item. All removed materials shall become property of the Contractor and be disposed of off-site or placed in the staging area as directed by the RPR for a period of 30 days for Airport to determine salvageable items. Excavations after removal shall be backfilled with material equal or better in quality than adjacent embankment. Backfilled and excavated areas must be compacted per Specification P-152.

126-2.7 Demolish Electrical Pullbox. Demolish the existing pullbox (includes FAA pullboxes). Removal shall include removal and disposal of existing concrete, bases, lids, wiring, encountered conduit, reconnection of conduit, and any other items necessary for the complete removal of the item. Protect conduits and cables where specified on the Plans. All removed materials shall become property of the Contractor and be disposed of off-site or placed in the staging area as directed by the RPR for a period of 30 days for Airport to determine salvageable items. Excavations after removal shall be backfilled with material equal or better in quality than adjacent embankment. Backfilled and excavated areas must be compacted per Specification P-152.

126-2.8 Demolish Airfield Sign and Pad. The existing sign shall be removed and disposed of off-site or placed in the staging area as directed by the RPR for a period of 30 days for Airport to determine salvageable items. Conductor, cans, conduit, and sign foundation to be demolished. Debris resulting from the removals shall become property of the Contractor and shall be removed and disposed of off-site. For the concrete pad, remove existing PCC sign pad. Removal shall include removal and disposal of existing concrete bases, wiring, encountered conduit, and any other items necessary for the complete removal of the item. All remove materials shall be removed and disposed of off-site. Excavations after removal shall be backfilled with material equal or better in quality than adjacent embankment. Backfilled and excavated areas must be compacted per Specification P-152.

126-2.9 Remove and Salvage Elevated Runway / Taxiway Edge Light, Fixture, and Transformer. Remove and salvage to owner, within the limits shown, existing runway edge lights. Removal shall include removal of edge light fixture for reuse. Conduit, conductors, and cans are to be protected in place. Install temporary cover on existing can. Debris resulting from the removals shall become property of the Contractor and shall be removed and disposed of off-site. Demolition debris shall not be used for fill or backfill. Fixtures and transformers shall be removed, salvaged and stockpiled as identified in the plans. The contractor shall indicate to the airport when salvaged items are stockpiled and allow the airport 30 days to salvage any items. Contractor shall dispose of any fixtures and transformers remaining after the 30-day salvage period identified in the plans.

126-2.10 Remove and Salvage In-pavement Runway Edge Light, Fixture, and Transformer. Remove and salvage to owner, within the limits shown, existing runway edge lights. Removal shall include removal of edge light fixture for reuse. Conduit, conductors, and cans are to be protected in place. Install temporary cover on existing can. Debris resulting from the removals shall become property of the Contractor and shall be removed and disposed of off-site. Demolition debris shall not be used for fill or backfill. Fixtures and transformers shall be removed, salvaged and stockpiled as identified in the plans. The contractor shall indicate to the airport when salvaged items are stockpiled and allow the airport 30 days to salvage any items. Contractor shall dispose of any fixtures and transformers remaining after the 30-day salvage period identified in the plans.

126-2.11 Demolish Elevated Taxiway / Runway Edge Light. Salvage Existing Fixture. Demolish existing elevated edge lights. Demolition shall include removal of can, cable, light fixture, and transformers. Debris resulting from the removals shall become property of the Contractor and shall be removed and disposed of off-site. Demolition debris shall not be used for fill or backfill. Fixtures and transformers shall be removed, salvaged, and stockpiled. The contractor shall indicate to the airport when salvaged items are stockpiled and allow the airport 30 days to salvage any items. Contractor shall dispose of any fixtures and transformers remaining after the 30-day salvage period identified in the plans.

126-2.12 Demolish In-pavement Taxiway / Runway Edge Light and Can. Salvage Existing Fixture. Demolish existing in-pavement lights. Demolition shall include removal of can, cable, light fixture, and transformers. Debris resulting from the removals shall become property of the Contractor and shall be removed and disposed of off-site. Demolition debris shall not be used for fill or backfill. Fixtures and transformers shall be removed, salvaged and stockpiled. The contractor shall indicate to the airport when salvaged items are stockpiled and allow the airport 30 days to salvage any items. Contractor shall dispose of any fixtures and transformers remaining after the 30-day salvage period identified in the plans.

126-2.13 Demolish MALSF Threshold Bar (13 Lights), Salvage Existing Fixtures. Demolish the existing MALSF bar. Removal shall include removal and disposal of existing concrete foundation, light bases, wiring, encountered conduit, and any other items necessary for the complete removal of the item. All removed materials shall become property of the Contractor and be disposed of off-site or placed in the staging area as directed by the RPR for a period of 30 days for Airport to determine salvageable items. Fixtures and transformers shall be removed and salvaged for reinstallation. Contractor shall test and record the voltage of the can transformers prior to removal.

126-2.14 Demolish MALSF Centerline Bar (5 Lights), Salvage Existing Fixtures. Demolish the existing MALSF bar. Removal shall include removal and disposal of existing concrete foundation with reinforcement, light bases, wiring, encountered conduit, and any other items necessary for the complete removal of the item. All removed materials shall become property of the Contractor and be disposed of off-site or placed in the staging area as directed by the RPR for a period of 30 days for Airport to determine salvageable items. Fixtures and transformers shall be removed and salvaged for reinstallation. Contractor shall test and record the voltage of the can transformers prior to removal. Base stems for elevated station bar shall be salvaged for modification and reinstallation.

126-2.15 Demolish Reinforced Concrete Foundation from Abandoned MALSF Bars. Remove an existing underground PCC MALSF bar. Removal shall include removal and disposal of existing concrete foundation with reinforcement, wiring, encountered conduit, and any other items necessary for the complete removal of the item. All removed materials shall become property of the Contractor and be disposed of off-site.

126-2.16 Demolish Concrete Valley Gutter. Demolish, within the limits shown, the existing PCC concrete gutter with reinforcement. Demolition shall include removal and disposal of existing concrete swale any other items necessary for the complete removal of the item. All removed materials shall become property of the Contractor and be disposed of off-site.

126-2.17 Demolish Abandoned Waterline, if Encountered. Demolish, within the limits shown if encountered, the existing abandoned water line, depth is unknown. Demolition shall include removal and disposal of existing waterline, capping or plugging the line at the removal limits with PCC, and any other items necessary for the complete removal of the item. The pipe material shall be legally disposed of off-site in a timely manner following removal. Trenches shall be backfilled with material equal to or better in quality than adjacent final embankment. Trenches under paved areas must be compacted to the requirements of the pavement section and P-152.

126-2.18 Backfilling. Unless otherwise provided in the Contract, backfill and compact in accordance with Item P-152 all trenches, holes and pits resulting from breaking down or removal of items described in this Section. Backfill to the elevation of the natural ground utilizing granular backfill or select material from adjacent excavation. In areas where removals occur in vegetated areas, topsoil, fertilize, and seed in accordance with Item T-901 and Item T-905. In areas outside the pavement reconstruction limits where

removal requires full depth pavement removal, asphalt shall be replaced at 1-inch greater thickness than the existing asphalt with aggregate base material placed and compacted at the depth of existing aggregate base.

126-2.19 Restoration. Restoration shall be incidental to the individual bid items.

METHOD OF MEASUREMENT

126-3.1 Remove of REILs will be measured per set. A set of REILs shall include all equipment associated with a particular runway, which for REILs is two fixtures/foundations per set. This bid item shall include removing, salvaging, and stockpiling all REIL equipment and equipment houses, disposal of all equipment, conduits, base cans, concrete foundations, and backfill material not wanted by the Airport, and all incidentals needed to complete the work.

126-3.2 Demolish Conduit, Cable, and Counterpoise, will be measured per linear foot measured along the conduit, completely removed, and accepted by the RPR, regardless of the number of cables contained in the conduit. The removal of conduit, regardless of the number of conduits in the duct bank, will only be measured once. This item shall include the identification of cable (s) needing to be removed along with all other cables routed in the same duct, handhole, manhole or junction can. The removal of cabling from a conduit, regardless of the number of times cabling is removed from that conduit, will only be measured once per conduit run. There is no separate measurement for removal of counterpoise; counterpoise removal is incidental to the cost of the conduit demolition, regardless of if the counterpoise is adjacent to or within the conduit.

126-3.3 Remove Cable and Counterpoise will be measured per linear foot measured along the conduit. This item shall include the identification of cable (s) needing to be removed along with all other cables routed in the same duct, handhole, manhole or junction can. The removal of cabling from a conduit, regardless of the number of times cabling is removed from that conduit, will only be measured once per conduit run. There is no separate measurement for removal of counterpoise; counterpoise removal is incidental to the cost of the cable removal, regardless of if the counterpoise is adjacent to or within the conduit.

126-3.4 Remove and Salvage Unlit Information Sign will be measured per each, completely removed, and accepted.

126-3.5 Remove and Salvage Unlit Information Sign, Demolish Pad will be measured per each, completely removed, and accepted.

126-3.6 Demolish Electrical Junction Can will be measured per each, completely removed, and accepted.

126-3.7 Demolish Electrical Pullbox will be measured per each, completely removed, and accepted.

126-3.8 Demolish Airfield Sign and Pad will be measured per each, completely removed, and accepted.

126-3.9 Remove and Salvage Elevated Runway / Taxiway Edge Light Fixture and Transformer will be measured per each, completely removed, and accepted.

126-3.10 Remove and Salvage In-pavement Runway Edge Light Fixture and Transformer will be measured per each, completely removed, and accepted.

126-3.11 Demolish Elevated Taxiway / Runway Edge Light, Salvage Existing Fixtures will be measured per each, completely removed, and accepted.

126-3.12 Demolish In-pavement Taxiway / Runway Edge Light and Can, Salvage Existing Fixtures will be measured per each, completely removed, and accepted.

126-3.13 Demolish MALSF Threshold Bar (13 Lights), Salvage Existing Fixtures will be measured per each bar, completely removed, and accepted. Measurement is per the entire threshold bar, not per light.

126-3.14 Demolish MALSF Centerline Bars (5 Lights), Salvage Existing Fixtures will be measured per each bar, completely removed, and accepted. Measurement is per the entire centerline bar, not per light.

126-3.15 Demolish Reinforced Concrete Foundation from Abandoned MALSF Bars shall be measured lump sum, completely removed, and accepted. Measurement is for all abandoned MASF bar foundations, not per bar.

126-3.16 Demolish Concrete Valley Gutter will be measured per linear foot.

126-3.17 Demolish Abandoned Waterline, if Encountered will be measured per liner foot. Alterations of bid quantity greater than twenty-five (25%) percent will not result in change in bid price.

126-3.18 Backfilling will not be separately measured, and no payment will be made, therefore, backfilling is incidental to the acceptable removal of the respective item. In areas requiring full depth pavement replacement, asphalt shall be measured and paid for as specified under P-401, and aggregate base shall be measured and paid for as specified under P-209.

BASIS OF PAYMENT

126-4.1 Remove REILs and Demolish PCC Foundation will be paid for at the Contract unit price per set removed and accepted by the RPR. This price will be payment in full for removal, disassembly, salvaging, and stockpiling of removed materials, for disposal of removed material not wanted by the Airport, and for furnishing all labor, tools, equipment, and incidentals necessary for a complete removal as accepted by the RPR.

126-4.2 Demolish Conduit, Cable, and Counterpoise (and when present, concrete encasement) will be paid at the Contract unit price per linear foot completely removed and accepted by the RPR. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete this item. This price shall also include all testing and if necessary, cable repair or replacement due to damage caused by cable removal.

126-4.3 Remove Cable and Counterpoise will be paid at the Contract unit price per linear foot completely removed and accepted by the RPR. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete this item. This price shall also include all testing and if necessary, cable repair or replacement due to damage caused by cable removal.

126-4.4 Remove and Salvage Unlit Information Sign will be paid for at the Contract unit price per each, which price will be payment in full for removal and salvage of the existing sign, furnishing all labor, tools, equipment, and incidentals necessary to complete the Work.

126-4.5 Remove and Salvage Unlit Information Sign, Demolish Concrete Pad will be paid for at the Contract unit price per each, which price will be payment in full for removal and salvage of the existing sign, disposal of the existing sign pad, and miscellaneous components to facilitate the complete removal of the pad; backfilling; and furnishing all labor, tools, equipment, and incidentals necessary to complete the Work.

126-4.6 Demolish Electrical Junction Can will be paid at the unit price per each completely removed and accepted by the RPR. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete this item.

126-4.7 Demolish Electrical Pullbox will be paid at the unit price per each completely removed and accepted by the RPR. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete this item.

126-4.8 Demolish Airfield Sign and Pad will be paid for at the Contract unit price per each, which price will be payment in full for demolition and disposal of the existing sign, sign pad, and other appurtenances; any miscellaneous components to facilitate the complete demolition; backfilling; and furnishing all labor, tools, equipment, and incidentals necessary to complete the Work.

126-4.9 Remove Elevated Runway / Taxiway Edge Light, Fixture, and Transformer, measured as provided above, will be paid for at the Contract unit price per each, which price will be payment in full for removal and salvage of the existing base can, foundation, and miscellaneous components to facilitate the complete

removal of the base can; temporarily weather-proofing cables until reconnection; and furnishing all labor, tools, equipment, and incidentals necessary to complete the Work.

126-4.10 Remove In-pavement Runway Edge Light Fixture and Transformer will be paid for at the Contract unit price per each, which price will be payment in full for removal and salvage; any miscellaneous components to facilitate the complete demolition; temporarily weather-proofing cables until reconnection; and furnishing all labor, tools, equipment, and incidentals necessary to complete the Work.

126-4.11 Demolish Taxiway / Runway Edge Light will be paid for at the Contract unit price per each, which price will be payment in full for demolition and disposal of the can, salvage or disposal of the light; any miscellaneous components to facilitate the complete demolition; backfilling; and furnishing all labor, tools, equipment, and incidentals necessary to complete the Work.

126-4.12 Demolish In-pavement Taxiway / Runway Edge Light will be paid for at the Contract unit price per each, which price will be payment in full for demolition and disposal of the can, salvage or disposal of the light; any miscellaneous components to facilitate the complete demolition; backfilling; and furnishing all labor, tools, equipment, and incidentals necessary to complete the Work.

126-4.13 Demolish MALSF Threshold Bar (13 Lights), Salvage Existing Fixtures will be paid for at the Contract unit price per each, which price will be payment in full for demolition and disposal of the concrete foundation with reinforcement, can, encountered conduits, salvage of the lights and transformers; any miscellaneous components to facilitate the complete demolition; backfilling; and furnishing all labor, tools, equipment, and incidentals necessary to complete the Work.

126-4.14 Demolish MALSF Centerline Bar (5 Lights), Salvage Existing Fixtures will be paid for at the Contract unit price per each, which price will be payment in full for demolition and disposal of the concrete foundation with reinforcement, can, encountered conduits, salvage of the lights and transformers; any miscellaneous components to facilitate the complete demolition; backfilling; and furnishing all labor, tools, equipment, and incidentals necessary to complete the Work.

126-4.15 Demolish Reinforced Concrete Foundation from Abandoned MALSF Bars will be paid for at the Contract unit price per lump sum, which price will be payment in full for demolition and disposal of the concrete with reinforcement; any miscellaneous components to facilitate the complete demolition; backfilling; and furnishing all labor, tools, equipment, and incidentals necessary to complete the Work.

126-4.16 Demolish Concrete Valley Gutter, measured as provided above, will be paid for at the contract unit price linear foot, which price will be payment in full for removal of existing concrete and any other items required for complete removal, as well as the furnishing of all materials, labor, equipment, tools, and incidentals necessary to complete the work.

126-4.17 Demolish Abandoned Waterline, if Encountered, will be paid for at the contract unit price linear foot, which price will be payment in full for removal of existing concrete and any other items required for complete removal, as well as the furnishing of all materials, labor, equipment, tools, and incidentals necessary to complete the work.

126-4.18 Backfilling will not be paid separately and shall be incidental to the acceptance of the removal of the respective item. Asphalt shall be paid per P-401 and crushed aggregate base per P-209.

Payment will be made under:

Item SP-126-4.1	Remove and Salvage REILs. Demolish PCC Foundations – per set
Item SP-126-4.2a	Demolish Conduit, Cable, and Counterpoise – per linear foot
Item SP-126-4.2b	Demolish Concrete Encased Conduit, Cable, and Counterpoise – per linear foot
Item SP-126-4.3	Remove Existing Cable and Counterpoise – per each
Item SP-126-4.4	Remove and Salvage Unlit Information Sign – per each
Item SP-126-4.5	Remove and Salvage Unlit Information Sign. Demolish Concrete Pad – per each

Item SP-126-4.6	Demolish Electrical Junction Can – per each
Item SP-126-4.7a	Demolish Electrical Pullbox – per each
Item SP-126-4.7b	Demolish FAA Pullbox – per each
Item SP-126-4.8	Demolish Airfield Sign and Pad – per each
Item SP-126-4.9a	Remove and Salvage Elevated Taxiway Edge Light, Fixture, and Transformer. Protect Can – per each
Item SP-126-4.9b	Remove and Salvage Elevated Runway Edge Light Fixture and Transformer. Protect Can – per each
Item SP-126-4.9c	Remove and Salvage Elevated Runway Threshold Light Fixture and Transformer. Protect Can – per each
Item SP-126-4.10	Remove and Salvage In-pavement Runway Edge Light Fixture and Transformer. Protect Can. – per each
Item SP-126-4.11a	Demolish Elevated Taxiway Edge Light and Can. Salvage Existing Fixture – per each
Item SP-126-4.11b	Demolish Elevated Runway Edge Light and Can. Salvage Existing Fixture – per each
Item SP-126-4.12a	Demolish In-pavement Taxiway Edge Light and Can. Salvage Existing Fixture – per each
Item SP-126-4.12b	Demolish In-pavement Runway Edge Light and Can. Salvage Existing Fixture – per each
Item SP-126-4.13	Demolish MALSF Threshold Bar (13 Lights). Salvage Existing Fixtures – per each
Item SP-126-4.14	Demolish MALSF Centerline Bar (5 Lights). Salvage Existing Fixtures – per each
Item SP-126-4.15	Demolish Reinforced Concrete Foundation from Abandoned MALSF Bars – per lump sum
Item SP-126-4.16	Demolish Concrete Valley Gutter – per linear foot
Item SP-126-4.17	Demolish Abandoned Waterline, if Encountered – per linear foot

END OF ITEM SP-126

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PART 2

Construction Safety and Phasing Plan (CSPP)

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OXNARD AIRPORT

COUNTY of VENTURA
Department of Airports

CONSTRUCTION SAFETY AND PHASING PLAN

Runway 7-25, Taxiway Connectors, and Parallel Taxiway Pavement Reconstruction

AIP No. 3-06-0179-037-2020 (Design)
AIP No. 3-06-0179-038-2021 (Construction)

DOA No. 20-02

Project No. OXR-146

Prepared by

Mead & Hunt

March 29, 2021

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1. OVERVIEW

This document presents the Construction Safety and Phasing Plan (CSPP) for the Runway 7-25, Taxiway Connectors, and Parallel Taxiway Pavement Reconstruction (Project) at Oxnard Airport (Airport), which is being performed and funded under the Federal Aviation Administration (FAA) Airport Improvement Program (AIP). Specifically, the Project scope includes the following elements:

BASE BID

This work will consist of the reconstruction of Runway 7-25. In the event that only the Base Bid is awarded, pavement transitions will also be constructed on the north portions of Taxiway Connectors A, B, C, D, and E to match existing grades. Specific work activities are shown in the table below.

BID ALTERNATE 1

This work will consist of the reconstruction of Taxiway Connectors A, B, C, D, and E. In the event that only the Base Bid and Bid Alternate 1 are awarded, pavement transitions will also be constructed on the south portions of Taxiway Connectors A, B, C, D, and E to match existing grades along parallel Taxiway F. Specific work activities are shown in the table below.

BID ALTERNATE 2

This work will consist of the reconstruction of Parallel Taxiway F. Specific work activities are shown in the table below.

SPECIFIC WORK ACTIVITIES

The table below lists major work activities to be performed in the Base Bid, and Bid Alternates 1 & 2:

Work Activity	Base Bid	Bid Alt 1	Bid Alt 2
Full-Depth Removal of Existing Asphalt Pavement	X	X	X
Cold Milling of Existing Asphalt Pavement	X	X	X
Removal of Electrical Infrastructure	X	X	X
Subgrade Preparation	X	X	X
Lime-treatment of Subgrade	X	X	X
Construction of Crushed Aggregate Base Course	X	X	X
Construction of Asphalt Surface Course	X	X	X
Construction of Aggregate Base Shoulders	X	X	X
Application of New Pavement Markings	X	X	X
Pavement Grooving	X	X	
Storm Drain Improvements	X	X	X
Installation of Underdrain System	X	X	X
Trenching and Installation of Electrical Conduit	X	X	X
Installation of Lights, Signs, and Junction Structures	X	X	X
Installation of Cable and Counterpoise	X	X	X
Reconstruction of MALSF Light Bars	X		

2. PURPOSE

The CSPP provides single source procedural information for all key Project personnel to use during construction, and defines the specific responsibilities of the Airport Operator, the Contractor, Airport users/tenants, and the Project Engineer. The FAA's Safety and Phasing Plan Checklist was utilized in the preparation of this CSPP, which includes (but is not limited to) provisions for Airport safety and security, operational limitations on construction activities, identifying potential hazards and the impacts those hazards may have on airfield and construction activities, and construction phasing requirements to minimize impact on airfield operations.

Requirements for maintaining operational safety during construction are in conformance with FAA Advisory Circular 150/5370-2G, "*Operational Safety on Airports During Construction*." The Project specific safety and phasing provisions for the Project elements are shown on Plan Sheets G-100, G-101, G-102, G-103, G-104, and G-105, as well as detailed in the Project Specifications. Copies of the Plan Sheets are attached to this report as *Attachment A*.

Throughout the document various terms and acronyms are referenced. A list of terms and acronyms is included as *Attachment C*.

3. CONSTRUCTION SAFETY AND PHASING RESPONSIBILITIES

3.1 AIRPORT OPERATOR

The Airport Operator is responsible for operational safety on the Airport at all times. The County of Ventura (Agency) is the Airport Operator. The Agency will issue Notice to Airmen (NOTAM) whenever construction activities occur in the Air Operations Area (AOA). Agency staff will provide oversight of all construction activities and coordinate those activities with the Air Traffic Control (ATC) personnel, Airport users (pilots), and Airport tenants. The Agency will hold weekly construction progress and safety meetings. During those meetings, operational safety will be reviewed, and an action plan will be developed, as needed, to address any discrepancies in safety that need to be corrected. The Agency will require the Contractor to submit a Safety Plan Compliance Document (SPCD) detailing the Contractor's compliance with the CSPP. Agency approval of the SPCD will be required prior to issuance of the Notice to Proceed (NTP) with Construction.

3.2 CONSTRUCTION CONTRACTOR

The Contractor will be determined by a competitive bidding process. The Contractor's responsibilities for safety and phasing are detailed and defined in the Contract Documents. The Contractor will be required to attend weekly progress and safety meetings and to correct any safety-related discrepancies. The Contractor is required to submit a completed SPCD to the Agency for review and approval before the NTP for Construction can be issued. A sample SPCD is included as *Attachment B.* The Contractor will be required to monitor construction safety on a daily basis, utilizing the "*Construction Project Daily Safety Inspection Checklist*" (see *Attachment D*) and provide copies to the Agency daily when work is performed on the Project.

3.3 AIRPORT USERS AND TENANTS

The Agency will notify Airport users and tenants of all pending construction activities that will impact them and advise the users and tenants of planned pavement closures and other activities in the AOA that will affect aircraft/Airport operations.

3.4 RESIDENT PROJECT REPRESENTATIVE (RPR)

As part of the Project construction management, observation, and quality assurance process, the RPR will monitor construction safety on a daily basis, utilizing the "*Construction Project Daily Safety Inspection Checklist*" (see *Attachment D)* to ensure an appropriate level of priority is given to safety. Any discrepancies in safety will be immediately brought to the attention of the Contractor and Agency for corrective action implementation.

4. CONSTRUCTION SAFETY AND PHASING

4.1 COORDINATION

4.1.1 Design Progress Meetings

Predesign conferences are held during the design development and design (Preliminary, 60%, 95%, and Final Bid Documents) phases. These meetings are held to help avoid possible conflicts between construction activities and the operations of the Airport. The CSPP was submitted to the FAA for initial review when the Project design was 95% complete. After the initial review, the 95% CSPP was uploaded to the FAA portal as directed by the FAA. An updated CSPP will be provided that incorporates any FAA comments received from the FAA portal upload.

4.1.2 Prebid Conference

A prebid conference will be held to help clarify and explain construction sequencing and schedule, site security requirements, and airfield safety measures required by Contract. The prebid conference will be held a minimum of 10 (ten) days prior to the bid opening date.

4.1.3 Baseline Construction Schedule

During the Mobilization Element, Phase 1 (as defined in Section 4.2), and no later than five (5) days prior to the preconstruction conference, the Contractor shall submit a baseline construction schedule to the RPR. The schedule shall be in accordance with Item SP-107 of the specifications and will be reviewed by the RPR and the Agency. A Notice to Proceed for construction will not be issued until the baseline construction schedule is approved by the RPR and the Agency.

4.1.4 Preconstruction Conference

A preconstruction conference will be held as soon as practicable after the Contract has been awarded and prior to issuance of the Notice to Proceed for construction. The preconstruction conference participants should include, but not be limited to, the Agency, Project Manager / Engineer, RPR, Airport management, testing laboratory representative, Contractor and subcontractor(s), Contractor's Project superintendent, Contractor's Project clerk, utility companies, Aircraft Rescue and Fire Fighting (ARFF) personnel, federal, state, and local agencies affected by the proposed construction, and an FAA representative. The approved baseline construction schedule will be presented by the Contractor at the preconstruction meeting and copies provided for all attendees, if held in-person. Electronic files (PDF) Contract Documents will be provided to the Contractor by the Agency.

4.1.5 Security Requirements

The Airport serves General Aviation and complies with strict security requirements. Access to the Airport will be limited to specific automatic gates which require a security card to access. Training of select construction personnel overseeing the Project is required, which may require multiple meetings

for a sit-down training session and quiz, flagger requirements, and driver's training class at the Airport to complete this process. Refer to Section 4.5.2.5 for additional information.

4.1.6 Contractor Progress Meetings

Contractor progress meetings will be held weekly for the duration of construction. Operational safety will be a standing agenda item for discussion during progress meetings throughout the Project. The Contractor's Project superintendent, Project manager, and Project foremen are required to attend all meetings. Specialty foremen for earthwork, paving, electrical crews, and other work elements are required to attend meetings during work for which they are involved. Date, time, and location of the progress meetings will be determined at the preconstruction meeting.

4.1.7 Required Meeting Summary

Several meetings will be required for this Project, as defined throughout the Contract Documents. The meetings shall include, but not be limited to, the following:

Meeting Type	**Frequency**	**Construction Personnel Required in Attendance (Min.)**
Pre-Construction	One, prior to NTP	Project Manager, Superintendent(s)
Quality Control / Quality Assurance Workshop	One, prior to NTP	Project Manager, Superintendent, Subcontractors as necessary, QC Firm, Testing Labs
Construction Progress and Safety	Weekly during construction	Project Manager, Superintendent
Driver and Safety Training	One, prior to NTP	As specified in CSPP
Pre-Paving Meeting	One, prior to paving	Project Manager, Superintendent, Paving Superintendent, QC Firm, Testing Lab
Public Outreach Meetings	Up to Four	Project Manager, Superintendent(s)

4.1.8 Scope or Schedule Changes

Scope or schedule changes for the Project may necessitate revisions to the CSPP and require review and approval by the Agency and the FAA.

4.1.9 FAA Air Traffic Organization (ATO) Coordination

The Airport currently has the following facilities maintained by the FAA ATO: Medium Intensity Approach Light System with Sequenced Flashing Lights (MALSF) (Runway 25), Instrument Landing System (ILS – Glide Slope and Localizer antennas) (Runway 25), PAPIs (one (1) on Runway 25 and one (1) on Runway 7). This Project will require the FAA-maintained NAVAIDS to be shut down. Additionally, the MALSF bar will be reconstructed and both PAPIs will be protected in place. It will be necessary for the FAA ATO to take part in the coordination meetings and kept current on the construction schedule. The Project will also require a flight check to verify the NAVAIDs are

installed/working properly prior to re-opening the Runway at the end of Construction Element Phase 1. The Contractor and electrical subcontractor shall be present during the flight check in case adjustments need to be made.

4.2 PHASING AND TIME LIMITATIONS

The Project has been divided into three Elements: 1) Mobilization, 2) Construction, and 3) Post-Construction. The Mobilization and Construction Elements have been divided into phases and work areas, as appropriate, to separate the construction areas and define the sequence of work associated with the Project. A separate NTP will be issued for the Mobilization and Construction Elements. The Notice to Proceed for the Construction Element will not be issued until Phase 1 of the Mobilization Element is complete and the SPCD is approved by the Agency. The work efforts and affected airfield areas within the AOA are detailed below. The Project duration depends on whether Bid Alternates 1 and 2 are awarded. The table below shows Project durations for each contract award scenario:

Contract Award	Mobilization Element, Phase 1	Mobilization Element, Phase 2	Construction Element, Phase 1	Construction Element, Phase 2	Total
Base Bid Only	14 Calendar Days	28 Calendar Days	91 Calendar Days	14 Calendar Days	147 Calendar Days
Base Bid + Bid Alternate 1	14 Calendar Days	28 Calendar Days	98 Calendar Days	14 Calendar Days	154 Calendar Days
Base Bid + Bid Alternates 1 & 2	14 Calendar Days	28 Calendar Days	105 Calendar Days	14 Calendar Days	161 Calendar Days

Construction Phase 2 shall begin no earlier than 30 days after the placement of asphalt surface course. If the Contractor fails to meet any of these time limitations, liquidated damages will be assessed as described in the Project Specifications.

4.2.1 Element 1 – Mobilization

4.2.1.1 Overview

In order to expedite the start date for the Construction Element, the Mobilization Element has been divided into two phases. Mobilization Phase 1 will occur prior to construction, and Mobilization Phase 2 will occur once construction has commenced. The two phases are further detailed below.

4.2.1.2 Mobilization Phase 1 Summary

The Notice to Proceed for Mobilization Element Phase 1 will be issued after the construction Contract is awarded. During Mobilization Phase 1, no work will be conducted that in any way restricts Airport operations. The Contractor will have 14 calendar days to complete Mobilization Phase 1. Work will include, but not be limited to, the following:

a. Processing of all submittals required for Project startup, including but not limited to the following:

(1) The Contractor's baseline construction schedule
(2) Preparation and submission of the SPCD
(3) Airfield safety and traffic control submittals
(4) Erosion control submittals
(5) Earthwork and subgrade stabilization submittals

b. Prequalification testing, review, and approval for subgrade stabilization materials.

c. Airfield Safety Devices delivered/prepared at the site (construction flags, low profile barricades, airport radios, runway closure markers). Further requirements on each of these devices are detailed herein.

d. Materials and equipment for airfield safety and traffic control, erosion control, earthwork and subgrade stabilization delivered to site.

e. All preliminary work required to commence construction will be finalized during Mobilization Phase 1 to minimize delays during construction.

4.2.1.3 Mobilization Phase 2 Summary

Mobilization Phase 2 will begin after Mobilization Phase 1 is complete and can occur during the Construction Element. The Contractor will have 28 calendar days to complete Mobilization Phase 2. Work will include, but not be limited to, the following:

a. Processing of all remaining submittals. Submittals shall be submitted early enough to be reviewed and approved by the RPR prior to the associated work activity. Assume an average turnaround time of 5 working days for the RPR to review.

b. Prequalification testing, review, and approval for remaining submittals.

c. Mix design preparation, review, and approval.

d. Materials and equipment for remaining work activities delivered to site.

4.2.2 Element 2 – Construction, Base Bid Only

4.2.2.1 Construction Phase 1 Summary and Phasing Restrictions (Base Bid Only)

a. Scope of work:
   (1) Pavement reconstruction of Runway 7-25
   (2) Mill and overlay of Taxiways A, B, C, D, & E
   (3) Infield grading
   (4) Electrical improvements
   (5) MALSF bar replacement
   (6) Storm drain improvements
   (7) Installation of new underdrain system
   (8) Initial application of pavement markings

b. Area closed to aircraft operations:
   (1) Runway 7-25
   (2) Taxiways A, B, C, D, & E

c. Duration of closure: 91 calendar days

d. Alternate taxi route: Not applicable

e. ARFF access routes: ARFF access to the construction work area will be heavily impacted due to pavement removal. ARFF personnel will be notified of the construction schedule and closures, and coordinate routes to the work area as appropriate. ARFF access to the rest of the airfield will not be impacted, with the exception of haul route crossings.

f. Construction staging area: The designated staging area for materials and equipment shall be located in the southwest corner of the airfield. It shall consist of the unpaved area along the north edge of the service road between Gate 9 and Taxiway E.

g. Construction access and haul route: The Contractor shall access the site via Gate 9 from South Victoria Avenue, then use the service road to enter the staging area and the work area at Taxiway E. The Contractor can also use Gate 6 and the service road parallel to Taxiway F as an alternate access point.

h. Impacts to NAVAIDs: The following NAVAIDs will be turned off by the FAA for the duration of Construction Phase 1:
   (1) Runway 25 MALSF
   (2) Runway 25 Localizer
   (3) Runway 25 Glideslope
   (4) Runway 25 PAPI
   (5) Runway 7 PAPI
   (6) The Project will also require a flight check to verify the NAVAIDs are installed/working properly at the end of Construction Phase 1. The Contractor and electrical subcontractor shall be present during the flight check in case adjustments need to be made.
   (7) An FAA inspector will be on-site during construction of the MALSF bar. The FAA will require at least 30-days notice to schedule the inspection. The Contractor shall account for this inspection in the schedule and be prepared to coordinate with the FAA as necessary.

i. Temporary lighting and marking changes:
   (1) All runway and taxiway circuits will be powered off (including REILs on RWY circuit).

j. Required hazard marking and lighting:
   (1) Low-profile barricades shall be placed as shown on the plan sheets.
   (2) Lighted runway closure markers shall be placed at each end of Runway 7-25.

k. Lead times for required notification: FAA requires a minimum 45-day notice prior to start of construction.

4.2.2.2 Construction Phase 2 Summary and Phasing Restrictions (Base Bid Only)

a. Scope of work:
   (1) Pavement grooving of Runway 7-25
   (2) Final application of pavement markings

b. Area closed to aircraft operations:
   (1) Runway 7-25
   (2) Taxiways A, B, C, D, & E

c. Duration of closure:
   (1) 14 calendar days of night closures. The closure will begin no earlier than 2200 and will end no later than 0800 on the following day. Contractor work hours will be from 2200 to 0600 to allow time for NAVAID restoration.
   (2) Construction Phase 2 shall begin no earlier than 30 days after placement of asphalt surface course.
   (3) Closure cannot happen during FAA moratorium (between Thanksgiving and New Year).

d. Alternate taxi route: Not applicable.

e. ARFF access routes: During night closures, ARFF access to the construction work area will be impacted due to Contractor equipment and barricades, but all areas will be paved. ARFF personnel will be notified of the construction schedule and closures, and coordinate routes to the work area as appropriate. ARFF access to the rest of the airfield will not be impacted.

f. Construction staging area: The designated staging area for materials and equipment shall be located in the southwest corner of the airfield. It shall consist of the unpaved area along the north edge of the service road between Gate 9 and Taxiway E.

g. Construction access and haul route: The Contractor shall access the site via Gate 9 from South Victoria Avenue, then use the service road to enter the staging area and the work area at Taxiway E. The Contractor can also use Gate 6 and the service road parallel to Taxiway F as an alternate access point.

h. Impacts to NAVAIDs: The following NAVAIDs will be turned off and on each shift by the FAA for the duration of Construction Phase 2:
   (1) Runway 25 MALSF
   (2) Runway 25 Localizer
   (3) Runway 25 Glideslope
   (4) Runway 25 PAPI
   (5) Runway 7 PAPI

i. Temporary lighting and marking changes: All runway and taxiway circuits will be powered off before each shift (including REILs on RWY circuit).

j. Required hazard marking and lighting:
   (1) Low-profile barricades shall be placed as shown on the plan sheets.
   (2) Lighted runway closure markers shall be placed at each end of Runway 7-25.

k. Lead times for required notification: FAA requires a minimum 45-day notice prior to start of construction.

4.2.3 Element 2 – Construction, Base Bid + Bid Alternate 1 Only

4.2.3.1 Construction Phase 1 Summary and Phasing Restrictions (Base Bid + Bid Alternate 1 Only)

a. Scope of work:
   (1) Pavement reconstruction of Runway 7-25 and Taxiways A, B, C, D, & E
   (2) Infield grading
   (3) Electrical improvements
   (4) MALSF bar replacement
   (5) Storm drain improvements
   (6) Installation of new underdrain system
   (7) Initial application of pavement markings

b. Area closed to aircraft operations:
   (1) Runway 7-25
   (2) Taxiways A, B, C, D, E, & F

c. Duration of closure: 98 calendar days

d. Alternate taxi route: Not applicable

e. ARFF access routes: ARFF access to the construction work area will be heavily impacted due to pavement removal. ARFF personnel will be notified of the construction schedule and closures, and coordinate routes to the work area as appropriate. ARFF access to the rest of the airfield will not be impacted, with the exception of haul route crossings.

f. Construction staging area: The designated staging area for materials and equipment shall be located in the southwest corner of the airfield. It shall consist of the unpaved area along the north edge of the service road between Gate 9 and Taxiway E.

g. Construction access and haul route: The Contractor shall access the site via Gate 9 from South Victoria Avenue, then use the service road to enter the staging area and the work area at Taxiway E. The Contractor can also use Gate 6 and the service road parallel to Taxiway F as an alternate access point.

h. Impacts to NAVAIDs: The following NAVAIDs will be turned off by the FAA for the duration of Construction Phase 1:
   (1) Runway 25 MALSF
   (2) Runway 25 Localizer
   (3) Runway 25 Glideslope
   (4) Runway 25 PAPI
   (5) Runway 7 PAPI
   (6) The Project will also require a flight check to verify the NAVAIDs are installed/working properly at the end of Construction Phase 1. The Contractor and electrical subcontractor shall be present during the flight check in case adjustments need to be made.
   (7) An FAA inspector will be on-site during construction of the MALSF bar. The FAA will require at least 30-days notice to schedule the inspection. The Contractor shall account for this inspection in the schedule and be prepared to coordinate with the FAA as necessary.

i. Temporary lighting and marking changes:
   (1) All runway and taxiway circuits will be powered off (including REILs on RWY circuit).

j. Required hazard marking and lighting:
   (1) Low-profile barricades shall be placed as shown on the plan sheets.
   (2) Lighted runway closure markers shall be placed at each end of Runway 7-25.

k. Lead times for required notification: FAA requires a minimum 45-day notice prior to start of construction.

4.2.3.2 Construction Phase 2 Summary and Phasing Restrictions (Base Bid + Bid Alternate 1 Only)

a. Scope of work:
   (1) Pavement grooving of Runway 7-25 and Taxiway D
   (2) Final application of pavement markings

b. Area closed to aircraft operations:
   (1) Runway 7-25
   (2) Taxiways A, B, C, D, E, & F

c. Duration of closure:
   (1) 14 calendar days of night closures. The closure will begin no earlier than 2200 and will end no later than 0800 on the following day. Contractor work hours will be from 2200 to 0600 to allow time for NAVAID restoration.

(2) Construction Phase 2 shall begin no earlier than 30 days after placement of asphalt surface course.
(3) Closure cannot happen during FAA moratorium (between Thanksgiving and New Year).

d. Alternate taxi route: Not applicable

e. ARFF access routes: During night closures, ARFF access to the construction work area will be impacted due to Contractor equipment and barricades, but all areas will be paved. ARFF personnel will be notified of the construction schedule and closures, and coordinate routes to the work area as appropriate. ARFF access to the rest of the airfield will not be impacted.

f. Construction staging area: The designated staging area for materials and equipment shall be located in the southwest corner of the airfield. It shall consist of the unpaved area along the north edge of the service road between Gate 9 and Taxiway E.

g. Construction access and haul route: The Contractor shall access the site via Gate 9 from South Victoria Avenue, then use the service road to enter the staging area and the work area at Taxiway E. The Contractor can also use Gate 6 and the service road parallel to Taxiway F as an alternate access point.

h. Impacts to NAVAIDs: The following NAVAIDs will be turned off and on each shift by the FAA for the duration of Construction Phase 2:
(1) Runway 25 MALSF
(2) Runway 25 Localizer
(3) Runway 25 Glideslope
(4) Runway 25 PAPI
(5) Runway 7 PAPI

i. Temporary lighting and marking changes: All runway and taxiway circuits will be powered off before each shift (including REILs on RWY circuit).

j. Required hazard marking and lighting:
(1) Low-profile barricades shall be placed as shown on the plan sheets.
(2) Lighted runway closure markers shall be placed at each end of Runway 7-25.

k. Lead times for required notification: FAA requires a minimum 45-day notice prior to start of construction.

4.2.4 Element 2 – Construction, Base Bid + Bid Alternates 1 & 2

4.2.4.1 Definition of Work Areas

a. Work Area 1: This work area consists of Runway 7-25, Taxiways A & E, and Taxiways B, C, & D up to the RSA.

b. Work Area 2: This work area consists of Taxiway F and the remainder of Taxiways B, C, & D.

c. The work areas are shown graphically in the Project Plans, included as *Attachment A*.

4.2.4.2 Construction Phase 1 Summary and Phasing Restrictions (Base Bid + Bid Alternates 1 & 2)

a. Scope of work:
(1) Pavement reconstruction of Runway 7-25 and Taxiways A, B, C, D, E, & F
(2) Mill and overlay of run-up aprons
(3) Infield grading

(4) Electrical improvements
(5) MALSF bar replacement
(6) Storm drain improvements
(7) Installation of new underdrain system
(8) Initial application of pavement markings

b. Area closed to aircraft operations:
(1) Runway 7-25 (only closed during Work Area 1 closure)
(2) Taxiways A & E (only closed during Work Area 1 closure)
(3) Taxiways B, C, D, & F (closed for the duration of Phase 1)

c. Duration of closure:
(1) The overall duration of closure for Phase 1 is 105 calendar days.
(2) Within the 84 calendar days, Work Area 1 can only be closed for 98 calendar days.
(3) Work Area 2 can be closed for the entire 105 calendar days.

d. Alternate taxi route:
(1) Not applicable during Work Area 1 closure.
(2) During the 7 calendar days that Runway 7-25 is operational, only Taxiways A & E will be accessible. However, due to limited clearance between the south limit of Work Area 2 and the AOA, aircraft will not be able to taxi between the West Apron and East Apron areas. Therefore, aircraft will need to back-taxi on Runway 7-25 in lieu of taxiing between the West Apron and East Apron areas.

e. ARFF access routes: ARFF access to the construction work areas will be heavily impacted due to pavement removal. ARFF personnel will be notified of the construction schedule and closures, and coordinate routes to the work areas as appropriate. ARFF access to the rest of the airfield will not be impacted, with the exception of haul route crossings.

f. Construction staging area: The designated staging area for materials and equipment shall be located in the southwest corner of the airfield. It shall consist of the unpaved area along the north edge of the service road between Gate 9 and Taxiway E.

g. Construction access and haul route: The Contractor shall access the site via Gate 9 from South Victoria Avenue, then use the service road to enter the staging area and the work area at Taxiway E. The Contractor can also use Gate 6 and the service road parallel to Taxiway F as an alternate access point.

h. Impacts to NAVAIDs: The following NAVAIDs will be turned off by the FAA for the duration of Work Area 1 closure:
(1) Runway 25 MALSF
(2) Runway 25 Localizer
(3) Runway 25 Glideslope
(4) Runway 25 PAPI
(5) Runway 7 PAPI
(6) The Project will also require a flight check to verify the NAVAIDs are installed/working properly at the end of Construction Phase 1. The Contractor and electrical subcontractor shall be present during the flight check in case adjustments need to be made.
(7) An FAA inspector will be on-site during construction of the MALSF bar. The FAA will require at least 30-days notice to schedule the inspection. The Contractor shall account for this inspection in the schedule and be prepared to coordinate with the FAA as necessary.

i. Temporary lighting and marking changes:
   (1) All runway and taxiway circuits will be powered off during Work Area 1 closure (including REILs on RWY circuit).
   (2) During the 7 calendar days that Runway 7-25 is operational, runway circuit will be powered back on, but taxiway circuit will remain powered off.

j. Required hazard marking and lighting:
   (1) Low-profile barricades shall be placed as shown on the plan sheets.
   (2) Lighted runway closure markers shall be placed at each end of Runway 7-25 during the Work Area 1 closure.

k. Lead times for required notification: FAA requires a minimum 45-day notice prior to start of construction.

4.2.4.3 Construction Phase 2 Summary and Phasing Restrictions (Base Bid + Bid Alternates 1 & 2)

a. Scope of work:
   (1) Pavement grooving of Runway 7-25 and Taxiway D
   (2) Final application of pavement markings

b. Area closed to aircraft operations:
   (1) Runway 7-25
   (2) Taxiways A, B, C, D, E, & F

c. Duration of closure:
   (1) 14 calendar days of night closures. The closure will begin no earlier than 2200 and will end no later than 0800 on the following day. Contractor work hours will be from 2200 to 0600 to allow time for NAVAID restoration.
   (2) Construction Phase 2 shall begin no earlier than 30 days after placement of asphalt surface course.
   (3) Closure cannot happen during FAA moratorium (between Thanksgiving and New Year).

d. Alternate taxi route: Not applicable

e. ARFF access routes: During night closures, ARFF access to the construction work area will be impacted due to Contractor equipment and barricades, but all areas will be paved. ARFF personnel will be notified of the construction schedule and closures, and coordinate routes to the work area as appropriate. ARFF access to the rest of the airfield will not be impacted.

f. Construction staging area: The designated staging area for materials and equipment shall be located in the southwest corner of the airfield. It shall consist of the unpaved area along the north edge of the service road between Gate 9 and Taxiway E.

g. Construction access and haul route: The Contractor shall access the site via Gate 9 from South Victoria Avenue, then use the service road to enter the staging area and the work area at Taxiway E. The Contractor can also use Gate 6 and the service road parallel to Taxiway F as an alternate access point.

h. Impacts to NAVAIDs: The following NAVAIDs will be turned off and on each shift by the FAA for the duration of Construction Phase 2:
   (1) Runway 25 MALSF
   (2) Runway 25 Localizer
   (3) Runway 25 Glideslope

(4) Runway 25 PAPI
(5) Runway 7 PAPI

i. Temporary lighting and marking changes: All runway and taxiway circuits will be powered off before each shift (including REILs on RWY circuit).

j. Required hazard marking and lighting:
(1) Low-profile barricades shall be placed as shown on the plan sheets.
(2) Lighted runway closure markers shall be placed at each end of Runway 7-25.

k. Lead times for required notification: FAA requires a minimum 45-day notice prior to start of construction.

4.2.5 Element 3 – Post-Construction

The Contractor shall adhere to the following post-construction requirements:

a. Once construction is substantially complete, the RPR and the Agency will conduct a final inspection in accordance with Section 50-15 of the FAA General Contract Provisions, included as Part 1 of the FAA standard specifications.

b. In order to achieve final acceptance, the Contractor shall complete all punch list items identified in the final inspection, complete final cleanup in accordance with Section 40-08 of the FAA General Contract Provisions, and provide warranties, Operations & Maintenance manuals, and other final Project documentation and actions in accordance with Sections 90-10 and 90-11 of the FAA General Contract Provisions. These items shall be completed no later than 30 calendar days after the date of the final inspection.

c. After final acceptance, the Contractor shall complete Project closeout requirements, which include but are not limited to providing affidavits of payments, confirming receipt of final payment, and release of performance bonds and escrow accounts.

4.2.6 Construction Safety and Phasing Plan Sheets

Drawings specifically indicating operational safety procedures and methods in affected areas have been developed for each construction phase and work area. These Drawings are included in the Contract Drawing Bid Package (Plan Sheets G-100, G-101, G-102, G-103, G-104, and G-105).

4.2.7 Example Schedule

To assist the Contractor in sequencing the work, an example schedule for each award scenario (total of 3) has been included as *Attachment E*. This schedule is intended as a guide only and may not incorporate all means and methods required by the Contractor. The example schedule shall in no way override any of the requirements listed in this CSPP and contract documents. The Contractor is responsible for planning and sequencing the work in order to meet the limitations specified herein. The dates shown in the schedule are estimated. Actual dates of construction will be contingent upon items detailed in Specification Item SP-107.

4.3 AREAS AND OPERATIONS AFFECTED BY CONSTRUCTION

4.3.1 Runways

Runway 7-25 will be affected by the Project. Refer to Section 4.2 “Phasing and Time Limitations” for specific runway closures and restrictions.

4.3.2 Taxiways and Taxilanes

Taxiways A, B, C, D, E, and F will be affected by the Project. Refer to Section 4.2 “Phasing and Time Limitations” for specific taxiway closures and restrictions.

4.4 NAVAID PROTECTION

The FAA owns and maintains the following NAVAIDS:

4.4.1 Runway 25 MALSF. The MALSF will be turned off by the FAA while Runway 7-25 is closed.

4.4.2 Runway 25 Glideslope. The glideslope will be turned off by the FAA while Runway 7-25 is closed.

4.4.3 Runway 25 Localizer. The localizer will be turned off by the FAA while Runway 7-25 is closed.

4.4.4 Runway 25 PAPI. The PAPI will be turned off by the FAA while Runway 7-25 is closed.

4.4.5 Runway 7 PAPI. The PAPI will be turned off by the FAA while Runway 7-25 is closed.

4.5 CONTRACTOR ACCESS

4.5.1 Location of Stockpiled Construction Materials and Equipment

Location of stockpiled materials and equipment storage will be in the staging areas or as approved by the Agency. Stockpiling materials and equipment outside the staging areas and within the AOA will require prior approval from the Agency and will be subjected to additional limitations depending on the height(s). Stockpiled material will meet the requirements of Section 4.6, “Wildlife Management” to prevent the stockpile location(s) from becoming wildlife attractants.

4.5.2 Vehicle and Pedestrian Operations

4.5.2.1 Construction Site Parking

Employees’ vehicles will be parked in the staging areas designated on the Plans or outside the AOA. No employee vehicles will be allowed beyond the staging area limits. Any employee entering the AOA with a vehicle will be required to have driver’s training, refer to Section 4.5.2.5. In areas where the staging area is adjacent to the perimeter security fence, all vehicles will be positioned a minimum of 10 feet away from either side of the fence.

4.5.2.2 Construction Equipment Parking

All service and construction vehicles and/or equipment will be parked in the staging area when not in use and will be positioned a minimum of 10 feet away from either side of a perimeter security fence. See Section 4.17, “Protection of Runway and Taxiway Critical Areas” for further parking restrictions within safety areas and object free areas. Unless a complex setup procedure makes movement of specialized equipment infeasible, inactive equipment will not be allowed to park on a closed taxiway or runway. If it is necessary to leave specialized equipment on a closed taxiway at night, the Agency must approve the request and the equipment will be lighted in accordance with Section 4.18, “Other Limitations on Construction.”

4.5.2.3 Access and Haul Roads

The Contractor will be restricted to use the Project security gates and haul routes shown on the drawings. Phase specific haul routes are shown on the Project Layout Plan. Right-of-way will be given to all emergency / ARFF vehicles and aircraft sharing the haul routes with the Contractor.

4.5.2.4 Marking and Lighting of Vehicles

Only marked Contractor-owned/operated vehicles required for the proper execution of the work will be allowed in the work area. Motor vehicles will be equipped with an omni-directional amber flashing light, head lights, tail lights, and flashers that will be used between sunset and sunrise or when visibility is low. Vehicles within the airfield environment will display company identification markings on both sides of the vehicle. Non-motorized equipment will have reflective devices displayed on the front, back, and sides. Vehicles and equipment will have an FAA orange and white checkered flag, 3 feet by 3 feet minimum, attached to a pole mounted on the rear bumper, and visible from 300 feet at all angles during daytime hours. All supervisory and survey personnel operating with escort by the RPR within the airfield environment, but outside the work area, will have a company vehicle with an amber flashing light mounted on the roof of the cab and identifying markings visible from 300 feet mounted on both sides of the vehicle.

4.5.2.5 Training Requirement for Vehicle Drivers

The Contractor shall designate construction personnel (minimum of 5) to receive training on movement around the Airport during the construction Project. The designated trained personnel will be responsible for escorting non-trained construction personnel who will be working within the airfield environment. The designated construction personnel will attend an airfield orientation/driver training class conducted by the Agency as part of the requirements to obtain authorization to operate on the airfield. The Contractor will contact the RPR or Operations Supervisor, a minimum of 48 hours in advance, to schedule a training class for the select construction personnel. No training classes will be available on Saturdays or Sundays. Training classes will be limited to ten (10) people maximum, per class. The approximate duration of the training class is thirty (30) minutes (Airfield Orientation/Driver).

4.5.2.6 Situational Awareness

Yield the right-of-way to moving aircraft (whether under tow or their own power) and pedestrians. While driving or working within the airfield environment, personnel will not wear any devices in or on their ears, other than those used to protect hearing or communicate company business. Yield right-of-way to emergency vehicles displaying rotating beacons (other than amber) and/or using sirens, and other audible emergency signals. In the event of an emergency, be prepared to move workers, vehicles, and equipment immediately at the direction of the Agency.

Texting or talking on the phone while driving anywhere on airport property is strictly prohibited.

4.5.2.7 Two-Way Radio Communication Procedures

All radio communications with the Air Traffic Control Tower (ATCT) or Common Traffic Advisory Frequency (CTAF) will be performed by Airport Operations / Agency personnel and/or a trained Contractor-provided construction safety coordinator. All activities within aircraft movement areas will require two-way radio communication (see “General Requirements for Airport Construction” of the Project specifications for Contractor’s requirement to purchase radios). The Contractor’s on-site foremen/lead/superintendents shall carry (or have immediately available) a VHF aviation radio. Additionally, if a sweeper is being used in the movement area and a flagger is not coordinating his/her movements, the sweeper operator shall also carry a radio. Frequencies that will be used by Agency personnel are:

- Oxnard Ground – 121.9 (0700-2100)
- Oxnard Tower – 134.95 (0700-2100)
- CTAF – 134.95 (2100-0700)

4.5.2.8 Airport Security

The gates with gate-operators shall be closed when not in use. Gates without gate-operators shall be locked or manned at all times. Where the Contractor's lock is used for access through Agency gates without a gate-operator, the lock shall be marked to identify the Contractor. Place the lock in series with existing locks. Failure to adhere to these requirements will result in the Contractor's lock being removed by the Agency.

4.6 WILDLIFE MANAGEMENT

The following are procedures to maintain existing wildlife mitigation devices, limit wildlife attractants, and notify Agency of wildlife encounters.

4.6.1 Trash

Receptacles will be provided by the Contractor and equipped with metal, canvas, or plastic covers. Food scraps or other trash may not be disposed on the ground and must be collected and placed in the covered receptacles so as not to attract wildlife.

4.6.2 Standing Water

Staging areas, stockpile areas, and the work area will be graded to drain to avoid attracting wildlife.

4.6.3 Tall Grass and Seeds

The use of low-quality seed mixtures that contain seeds of plants (such as clover) that attract wildlife will not be used. Grass and weeds will be managed, or cut if necessary, within work areas to avoid attracting wildlife habitation.

4.6.4 Fencing and Gates

Fences and/or gates that are unmaintained and/or left open and unattended permit unwanted wildlife to enter inside the Airport perimeter fence. Refer to 4.5.2.8, "*Airport Security*" for requirements on maintaining the secured area of the Airport. Contractor personnel will immediately notify the Agency if any unwanted wildlife is observed inside the Airport perimeter fence.

4.6.5 Disruption of Existing Wildlife Habitat

Not applicable for this Project.

4.7 FOREIGN OBJECT DEBRIS (FOD) MANAGEMENT AND DUST CONTROL

The Contractor will be required to ensure the airfield environment is kept continuously free of construction debris, equipment and/or materials that might endanger or be ingested by an aircraft. Contractor will take extreme care to ensure that no work-related debris or other loose items are allowed to be blown by wind or aircraft engine blast. The Contractor will be responsible for any resulting damage to aircraft engines and/or other property arising from failure to secure and/or protect debris, tools, supplies, or other loose items. Following the requirements described herein will help eliminate the potential for FOD. In areas that may result in the tracking of soil, sediments, or hazardous materials on the wheels of hauling equipment outside the area that are enclosed by erosion and silt/sediment control devices, the Contractor will provide the means and methods to remove these materials prior to the vehicle exiting the controlled area. If water wash stations are used, the Contractor will provide systems for the collection, treatment, and disposal of wheel wash water and accumulated sediment. Equipment operated on haul routes over existing pavements will be kept free of material spillage and foreign matter at all times. Haul routes that are shared with aircraft operations will be cleaned continuously with regenerative air vacuum sweepers, or other Agency approved methods.

Dust control will be in conformance with "Dust Control" of the State Standard Specifications and “Air Pollution Control” of the Ventura County Standard Specifications. The Contractor will provide the ways and means to prevent dust, grit and other waste products from becoming a nuisance in and around the working areas. The Contractor will take action as necessary, with the approval of the Agency, to reduce or eliminate such nuisance. The Contractor will control dust during the entire Contract period, including holidays and weekends.

Application of water for controlling dust caused by construction operations or the passage of traffic through the work area(s) will be applied as directed by the Agency at the Contractor’s expense.

4.8 HAZARDOUS MATERIALS (HAZMAT) MANAGEMENT

4.8.1 Shipments of Hazardous Materials

If shipments of hazardous material (including hazardous debris, contaminated soil or water, and hazardous waste) will be unloaded onto or loaded from Agency property, the Contractor will have a qualified person available onsite when shipments are received or prepared to ship who is current with U.S. Department of Transportation (DOT) approved training for the transportation of hazardous materials. Contractor will properly characterize and manifest waste material leaving the Agency property for disposal. When the waste reaches its final destination, the owner or operator of the designated and permitted treatment, storage, and disposal (TSD) facility will sign the manifest and return a copy to the Agency within 35 days to confirm receipt.

4.8.2 Spills

4.8.2.1 Minor Spill

Minor spills can be controlled by the first responder at the discovery of the spill. Use absorbent materials on small spills rather than hosing down or burying the spill. First responder should contain the spread of the spill, recover spilled materials, clean the contaminated area, and properly dispose of contaminated materials. For minor spills, consult the products Material Safety Data Sheets (MSDS) for recommended actions for spills or container leaks. Additionally, MSDSs will provide emergency phone numbers and occupational health hazard information.

4.8.2.2 Semi-significant Spills

Semi-significant spills can be controlled by the first responder along with the aid of other personnel such as laborers, the foreman, etc. Notify the Agency of semi-significant spills. Spills should be cleaned up immediately. Contain the spread of the spill and notify the Project foreman immediately. If the spill occurs on paved or impermeable surfaces, clean up by using dry methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely. If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil. If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

4.8.2.3 Significant / Hazardous Spills

Significant/Hazardous spills that cannot be controlled by personnel in the immediate vicinity must be reported to the local emergency response by dialing 911. In addition to 911, the Contractor will notify the Agency, proper Agency officials, and the state Emergency Services Warning Center. The services of a Spills Contractor or a HAZMAT team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staff arrives at the jobsite. Other agencies that may need to be consulted include, but are not limited to, the Fire Department, the Public

Works Department, the Highway Patrol, the Agency/County Police Department, and the Department of Toxic Substance.

4.8.3 Delivery and Storage of Hazardous Goods

a. Ensure that hazardous goods and materials delivered to or from the construction site meet applicable DOT labeling and placarding requirements. Upon request from the Agency, supply MSDSs for all hazardous material being delivered to the site.

b. The storage and shipment of hazardous waste will also comply with the requirements of this section.

c. It is emphasized, however, that although spills resulting from incidents or accidents should be responded to, securing the well-being of people will be the first priority.

d. Good housekeeping practices should be utilized during equipment fueling and maintenance operations. Inspect fueling equipment for leaks prior to dispensing. Fueling operations will be continuously attended to while dispensing fuel. Fueling and maintenance operations will not be performed within 50 feet of a storm drain, inlet, ditch, surface water, wetland, etc. to allow adequate time for containment in the event of a spill.

4.9 NOTIFICATION OF CONSTRUCTION ACTIVITIES

4.9.1. Responsible Representatives / Points of Contact:

Airports/Utility Staff Member	Title	Phone/Office	Cell
Kip Turner	Director of Airports	805-388-4200	
Dave Nafie	Deputy Director of Airports	805-388-4201	
Erin Powers	Projects Manager	805-388-4205	805-947-6800
John Feldhans	Operations Supervisor	805-388-4246	805-402-9971
Sean Herder	Operations Supervisor	805-382-3024	805-947-6798

FAA Staff Member	Title	Phone/Office	Cell
James M. Hensley*	FAA Engineering Services	310-365-9163	
B.K. Fleming	FAA Systems Support Center Manager		805-790-4012
Roger Green	FAA Air Traffic Management	805-984-2014	
Patrick McDermott	FAA Engineering Services	425-757-6245	

*Contact procedures: Contact Patrick McDermott if James M. Hensley cannot be reached.

Additional points of contact will be provided at the Preconstruction Meeting.

4.9.2. NOTICES TO AIRMEN (NOTAM)

Only the Agency may initiate or cancel a NOTAM on Airport conditions and is the only entity that can close or open a runway. Points of contact for issuing NOTAMS are as follows:

- Main Contact: John Feldhans

- Alternate Contact: Sean Herder
- Cc: Kip Turner, Dave Nafie, and Erin Powers

4.9.3. Emergency Contact Information

- Emergency – Dial 911
- Department of Airports Emergency Line – 805-947-6804
- Los Angeles Air Route Traffic Control Center – 661-575-2052
- ATCT Radio Emergency – 805-382-1570 (Emergency use only)
- Oxnard Police Department – 805-385-7600
- Oxnard Fire Department – 805-385-7722
- Hospital – Community Memorial– 805-278-0511
- California Poison Center – 1-800-222-1222

4.9.4. Coordination with Aircraft Rescue and Firefighting (ARFF) Personnel

The proposed Project will not deactivate waterlines or hydrants, but the Project may block airfield emergency routes. The Project is not anticipated to include the use of hazardous materials. ARFF personnel will be briefed by the Agency as to the construction schedule and determine alternate emergency access routes. If additional notification of ARFF personnel is required, the Contractor will contact the Agency.

4.9.5. Notification of the FAA

4.9.5.1 Part 77

The Project will not affect navigable airspace while the runway is open, therefore, the Agency will not be required to submit a FAA Form 7460-1, "*Notice of Proposed Construction or Alteration*" for a specific element. The Agency will, however, submit Form 7460-1 for the proposed critical construction equipment within the Project work areas when the runway is open. Any equipment (cranes, graders, other equipment) used by the Contractor that exceeds the height limitation in Section 4.18, "Other Limitations on Construction" must also have a Form 7460-1 airspace evaluation and determination prior to use.

4.9.5.2 Airport owned/FAA maintained NAVAIDS

If construction operations require a shutdown of more than 24 hours or more than 4 hours on consecutive days of a NAVAID owned by the Airport but maintained by the FAA, provide a 45-day minimum notice to FAA ATO/Technical Operations prior to facility shutdown.

4.9.5.3 FAA owned NAVAIDS

The Agency must notify the appropriate FAA ATO Service Area Planning and Requirements (P&R) Group a minimum of 45 days prior to implementing an event that causes impacts to NAVAIDs. Impacts to FAA equipment covered by a Reimbursable Agreement (RA) do not have to be reported by the Airport Operator. The Agency must coordinate work for a FAA owned NAVAID shutdown with the local FAA ATO/Technical Operations office, including any necessary reimbursable agreements and flight checks. In the event of an unanticipated utility outage or cable cuts that impact FAA NAVAIDs, contact the Airport Manager immediately. A RA will be included in this Project. As part of the RA, FAA

will conduct the Joint Acceptance Inspection (JAI) after construction is completed. Everything noted in the JAI will be cleared by the Agency no later than 30 calendar days from the JAI inspection.

4.10 INSPECTION REQUIREMENTS

4.10.1 Daily Inspections

Inspections should be conducted by the Contractor at least daily, but more frequently if necessary, to ensure conformance with the CSPP. Special attention will be given to areas shared by construction traffic and air traffic. These areas will be maintained in accordance with Section 4.7, "Foreign Object Debris Management and Dust Control." The Agency will have the final authority in determining if the area is suitable for aircraft use.

4.10.2 Final Inspections

A final inspection will be conducted by the Agency prior to the commissioning of any construction-impacted areas open to air traffic. The Agency will have the final authority in determining if the area is suitable for aircraft use. *Attachment D* contains a *Daily Safety Inspection Checklist* that may be used by the Contractor or Agency.

4.11 UNDERGROUND UTILITIES AND NOTIFICATION RESPONSIBILITIES

Contractor must notify DigAlert by calling either 8-1-1 or 1-800-422-4133 (www.digalert.org), and any other owners of underground utilities within the construction area or within affected public rights-of-way or easements in advance of the commencement of excavation activities. Also, notify the Agency when the call is being initiated so the Agency can provide information to Airport utilities as well.

Contractor will not cross electrical or communication cables unless protected by approved means. In the event of interruption to field-located utility services as a result of the work, promptly notify the Agency first, and then the proper authority. Cooperate with said authority in restoring service as promptly as possible. If required, the Contractor will install suitable temporary service until permanent repair is completed.

4.12 PENALTIES

The Contractor is responsible for maintaining security during construction as detailed herein. The Airport is subject to fines up to $20,000 for security violations. The Contractor will be responsible for any fines caused by his failure to observe the security requirements contained herein or required by the SPCD. Violations will be cause for the Project to be stopped and Project safety procedures evaluated. Contractor working days will continue to be charged, even if the Agency ceases construction operations. The Agency will decide if and when work will continue. Enforcement of these regulations will be by the Agency, Police, and/or Airport Operations Staff.

4.13 SPECIAL CONDITIONS, SAFETY ADHERENCE

During construction on the Airport, Contractor must be aware of the following conditions and required actions.

a. The Agency will notify the Contractor in the unlikely event of an aircraft in distress. An aircraft in distress may require the Contractor to immediately move equipment away from an aircraft movement area. The Contractor will be required to comply with all Agency and/or ATC instructions.

b. Various circumstances, such as an aircraft accident, security breach, or other unforeseen events may require suspension of the construction. The Agency will notify the Contractor when suspension of the work will be required. See Section 4.9, "Notification of Construction Activities" for emergency contact information.

c. A VPD (vehicle / pedestrian deviation) is any entry or movement on the movement area by a vehicle or pedestrian that has not been authorized by ATC. In the event of a VPD, the Agency reserves the right to suspend the work, or any portion thereof, and continue suspension until the completion of any investigation or evaluation by the Agency and full compliance with any corrective measures that the Agency may reasonably require. The citations range from $480 to $700 (including court fees) and will be issued to individuals in non-compliance. In addition, the Agency may require the Contractor to provide to the Agency a written plan, satisfactory to the Agency, to demonstrate the Contractor's ability to prevent future violations. See Section 4.5, "Contractor Access" for vehicle and pedestrian operations and two-way radio communication requirements.

d. During CAL FIRE, U.S. Forest Service, or any other emergency air operations, the Contractor may be instructed to cease work or vacate specific areas of the Airport. Any delays caused by ordered cessation of work will be grounds for time extensions as approved by the Engineer. No additional payment will be allowed for emergency cessation of work.

4.14 RUNWAY AND TAXIWAY VISUAL AIDS

4.14.1 Temporary Signs or Visual NAVAIDS

The nature of this construction Project and duration of closures will not require the addition of temporary lighting, signs, or visual NAVAIDs to be incorporated into this Project.

4.14.2 Lighting

4.14.2.1 Temporarily Closed Taxiways

Temporarily closed taxiways are identified in Section 4.2 "Phasing and Time Limitations". If possible, the temporarily closed taxiway(s) will have the edge lighting circuit deactivated. When deactivation is not possible (e.g., other taxiways on the same circuit remain open), the light fixtures will be covered in such a way to prevent light leakage. The use of temporary jumper wires may be required to maintain operation of existing edge lights.

4.14.2.2 Temporarily Closed Runways

The runway lights will be disabled, by the Contractor, for the duration of the runway closure.

4.14.3 Airfield Signs

4.14.3.1 Temporarily Closed Taxiways

Temporarily closed taxiways are identified in Section 4.2 "Phasing and Time Limitations". If possible, the temporarily closed taxiway(s) will have the taxiway signs deactivated. When deactivation is not possible (e.g., other taxiways on the same circuit remain open), the signs will be covered in such a way to prevent light leakage.

4.14.3.2 Temporarily Closed Runways

The runway airfield signs will be disabled, by the Contractor, for the duration of the runway closure.

4.15 MARKING AND SIGNS FOR ACCESS ROUTES

The Contractor shall place traffic control signs and/or devices along Victoria Avenue and/or 5th Street and adjacent to the Airport entrance gate as appropriate, to advise the general public and Airport users of construction operations and hauling.

Signs and/or devices will conform to the California Manual on Uniform Traffic Control Devices (MUTCD), Current Edition.

4.16 HAZARD MARKING AND LIGHTING

a. Before starting work, provide and have available all signs, barricades, and lights necessary for protection of the work. Install and maintain adequate warning signs and lighted barricades to protect property and personnel in the work area. Barricades shall be weighted or anchored to prevent overturning from wind or aircraft engine blast.

b. Barricades are not permitted in any active safety area. Barricades located within a runway or taxiway object free area and/or on aprons must be as low as possible to the ground, and no more than 18 inches high, exclusive of supplementary lights. The Contractor shall provide low-profile barricades (up to 520), marked with diagonal, alternating, orange and white stripes, to separate all construction/maintenance areas from the movement areas listed above. For the barricades, the Contractor shall provide red omni-directional flashers (2 per barricade) and an orange vinyl flag. Low-profile barricades will be spaced a maximum of 4 feet apart, unless directed otherwise by the Agency.

c. Runway closure markers will be placed on runways whenever runways are closed. The Contractor shall provide one set of trailer-mounted closure crosses. The Contractor will be responsible for placing, fueling, lubricating, maintaining flashing lights, and removing closure crosses.

d. The Contractor will have a person on call 24 hours a day for emergency maintenance of Airport hazard lighting and barricades. The Contractor must file the contact person's information with the Agency. Lighting will be checked for proper operation at least once per day, preferably at dusk.

e. Open trenches, excavations, or obstructions not being actively worked will be marked with lighted and weighted barricades that can be seen from a reasonable distance.

f. Orange exclusion fence will be used to delineate restricted areas as shown on the Drawings. The fence will be according to the specifications.

4.17 PROTECTION OF RUNWAY AND TAXIWAY CRITICAL AREAS

4.17.1 Runway Safety Area (RSA)

No construction may occur within the existing RSA while the runway is open for aircraft operations. Open trenches or excavations are not permitted within the RSA while the runway is open. If possible, backfill trenches before the runway is opened. If the runway must be opened before excavations are backfilled, cover the excavations appropriately. Covering for open trenches must be designed to allow the safe operation of the heaviest aircraft (100,000 pound dual wheel loading) operating on the runway across the trench without damage to the aircraft. Contractors must prominently mark open trenches and excavations at the construction site with red or orange flags, as approved by the Agency, and light them with red lights during hours of restricted visibility or darkness. Soil erosion must be controlled to maintain RSA standards, that is, the RSA must be cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations, and be capable, under dry conditions, of supporting the occasional passage of aircraft without causing structural damage to the aircraft. The ground surface within the RSA will not have edges exceeding 3 inches or slopes greater than 5 percent unless the runway is closed. Equipment must be removed from the RSA when not in use. The

dimensions for the Runway 7-25 RSA (Category D-III) is 250 feet each side of centerline and 1000 feet beyond each runway end. The RSA is depicted on the work area Plans contained in *Attachment A*.

4.17.2 Runway Object Free Area (ROFA)

Construction, including excavations, may be permitted within the ROFA; however, equipment must be removed from the ROFA when not in use and material should not be stockpiled in the ROFA, if not necessary. Stockpiling material in the ROFA requires submittal of a 7460-1 form and Agency approval. The dimensions for the Runway 7-25 ROFA (Category D-III) is 400 feet each side of centerline and 1000 feet beyond each runway end. The ROFA is depicted on the work area Plans contained in *Attachment A*.

4.17.3 Taxiway Safety Area (TSA)

No construction may occur in the TSA while the taxiway is open to aircraft operations, unless otherwise specified. Open trenches or excavations are not permitted within the TSA while the taxiway is open. If possible, trenches should be backfilled before the taxiway is opened. If the taxiway must be opened before excavations are backfilled, cover the excavations appropriately. Covering for open trenches must be designed to allow the safe operations of the heaviest aircraft (100,000 pound dual wheel loading) operating on the taxiway across the trench without damage to the aircraft. Contractors must prominently mark open trenches and excavations at the construction site with red or orange flags, as approved by the Agency, and light them with red lights during hours of restricted visibility or darkness. The ground surface within the TSA will not have edges exceeding 3 inches or slopes greater than 5 percent unless the taxiway is closed. Soil erosion must be controlled to maintain TSA standards, that is, the TSA must be cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations, and be capable, under dry conditions, of supporting the occasional passage of aircraft without causing structural damage to the aircraft. The only taxiways that will be operational during construction are Taxiways A & E (only during Work Area 2 closure if both bid alternates are awarded), and Taxiway F (if Bid Alternate 2 is not awarded). The TSA is 59 feet each side of centerline. The TSAs are depicted on the work area Plans contained in *Attachment A*.

4.17.4 Taxiway Object Free Area (TOFA)

No construction will be allowed within the TOFA while the taxiway is open to aircraft operations. The only taxiways that will be operational during construction are Taxiways A & E (only during Work Area 2 closure if both bid alternates are awarded), and Taxiway F (if Bid Alternate 2 is not awarded). The TOFA is 93 feet each side of centerline. The TOFAs are depicted on the work area Plans contained in *Attachment A*.

4.17.5 Obstacle Free Zone (OFZ)

Personnel, material, and/or equipment may not penetrate the OFZ while the runway is open to aircraft operations. The dimensions for Runway 7-25 OFZ are 200 feet each side of centerline and 200 feet beyond each runway end.

4.17.6 Runway Approach/Departure Surfaces

When the runway is open, all personnel, material, and/or equipment must remain clear of the threshold siting surfaces (approach and departure surfaces).

4.17.7.1 Runway 7-25 Approach Surface

Runway 7-25 is a precision runway. Using Table 3-2 and Figure 3-3 from AC 150/5300-13A for Runway

Category 7, the resulting approach surface begins 200 feet from the runway threshold and consists of a trapezoid with the following dimensions:

a. Width at inner departure – 800 feet

b. Width at outer departure – 3,800 feet

c. Length of departure – 10,000 feet

d. Approach slope – 34:1

4.17.7.2 Runway 7-25 Departure Surface

Runway 7-25 is a precision runway. Using Table 3-2 and Figures 3-4 from AC 150/5300-13A for Runway Category 9, the resulting departure surface begins at the runway threshold and consists of a trapezoid with the following dimensions:

a. Width at inner departure (runway threshold) – 1,000 feet

b. Width at outer departure – 6,466 feet

c. Length of departure – 10,200 feet

d. Departure slope – 40:1

4.17.7.3 Affected Approach Surface

The approach surface for Runway 7-25 will be unaffected by construction when the runway is open.

4.17.7.4 Affected Departure Surface

The departure surface for Runway 7-25 will be unaffected by construction when the runway is open.

4.18 OTHER LIMITATIONS ON CONSTRUCTION

4.18.1 Prohibitions

a. Open flame welding or torches are prohibited unless fire safety precautions are provided and the Agency has approved their use.

b. Electrical blasting caps are prohibited on or within 1,000 feet of the Airport property.

c. The use of flare pots are prohibited within the AOA.

d. No smoking will be allowed within the airfield environment except as designated by the Agency.

4.18.2 Restrictions, Equipment

a. Construction equipment that extends 15 feet or more above ground level will be cleared through the Agency prior to moving onto site. Equipment that may be lowered readily will be lowered at night, during reduced daytime visibility, and during other periods of storage to comply with the 15-foot height limitation.

b. If directed by the Agency, construction equipment that cannot be lowered below the 15-foot height limitation will be lighted at night and during periods of reduced daytime visibility. The light will be mounted on the highest point of equipment; will be omni-directional; and will consist of, at a minimum, one 100-watt bulb enclosed within an aviation red lens. Also, for daytime operations, mount an FAA-approved 3-foot square orange and white checkered flag at the highest point.

c. During daylight hours with severe visibility problems or heavy fog, cranes will not operate. The

Agency will determine when visibility problems exist and will coordinate and designate requirements for position and location of flag and light.

4.19 SAFETY PLAN COMPLIANCE DOCUMENT (SPCD), INFORMATION

The SPCD will detail how the Contractor will comply with the CSPP. This will include all Project-specific Construction Safety Plan details not included in the CSPP, including construction equipment heights, any applicable hazard management requirements, and contact information for the Contractor's safety management staff responsible for monitoring the CSPP and SPCD during construction. The SPCD will be an attachment to, and enhancement of, the Project CSPP. See *Attachment B* for sample of SPCD.

The SPCD must include a statement that the Contractor understands the operational safety requirements of the CSPP and provide assertion that the Contractor will not deviate from the approved CSPP and SPCD without written approval from the Agency. Any construction operation, activity, or practice proposed by the Contractor that does not conform to the CSPP and SPCD will require a revision to those documents. The revised CSPP and SPCD must be submitted to Agency for review and approval prior to performing any activities that are not in compliance with a previously approved CSPP.

Copies of the approved CSPP and SPCD must be available on-site at all times. The Contractor will ensure all construction personnel are familiar with the safety procedures and regulations applicable to construction on the Airport. At least one of the Contractor's safety management staff must be on-site whenever active construction is ongoing to act as point of contact and immediate response coordinator to correct any construction-related activity that may adversely affect operational safety of the Airport.

ATTACHMENTS:

Attachment A – Plan Sheets
Attachment B – Sample Safety Plan Compliance Document
Attachment C – Definition of Terms and Acronyms
Attachment D – Daily Safety Inspection Checklist
Attachment E1 – Example Schedule for Base Bid
Attachment E2 – Example Schedule for Base Bid + Bid Alternate 1
Attachment E3 – Example Schedule for Base Bid + Bid Alternates 1 and 2

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ATTACHMENTS

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Attachment A - Plan Sheets

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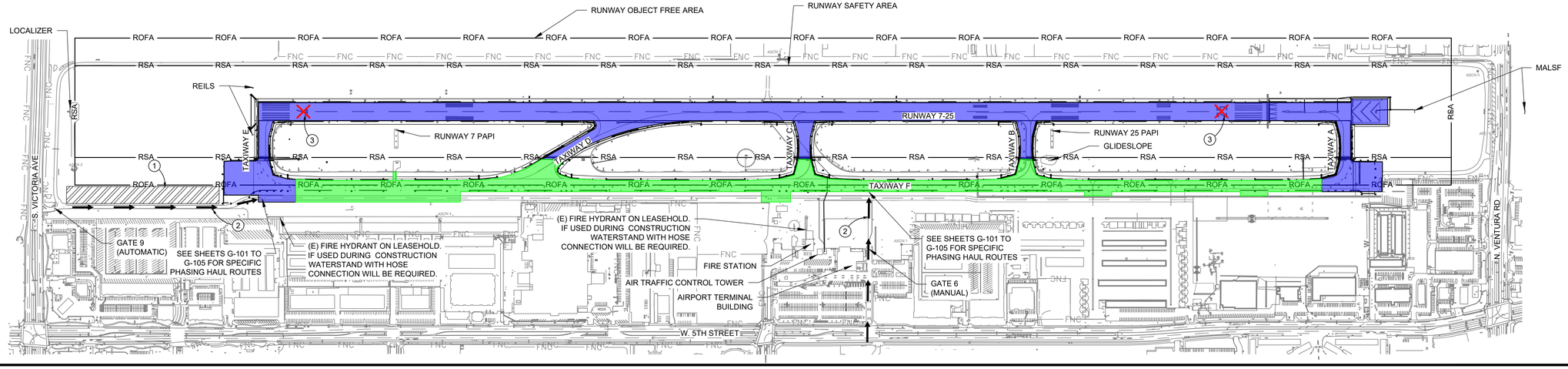
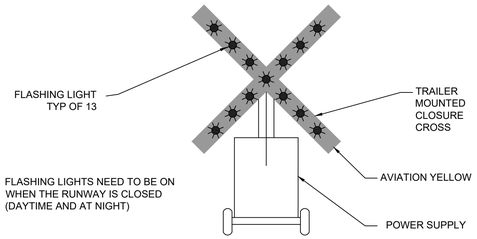
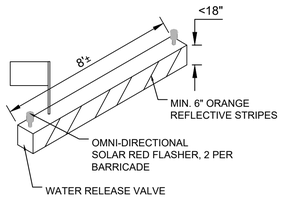




NOTE:
LIGHTED, GENERATOR POWERED RUNWAY MARKERS SUPPLIED BY THE CONTRACTOR SHALL BE INSTALLED AT ANY TIME THE RUNWAY IS CLOSED AND REMOVED BY THE CONTRACTOR PRIOR TO OPENING PER THE SCHEDULE APPROVED BY THE ENGINEER. THE MARKERS SHALL BE FUELED, OILED AND MAINTAINED BY THE CONTRACTOR THROUGHOUT THE PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CHECKING AND REPLACING BULBS ON A DAILY BASIS.

1 LIGHTED RUNWAY CLOSURE MARKER
NO SCALE



LOW PROFILE BARRICADES SHALL BE LESS THAN 18" IN HEIGHT. LOW PROFILE BARRICADES SHALL BE CONSTRUCTED OF UV RESISTANT POLYETHYLENE, WATER FILLED, APPROX. 8' IN LENGTH, ORANGE AND WHITE COLORED, AND INCLUDE FLASHING SOLAR AND BATTERY POWERED LIGHTS. MAXIMUM SPACING BETWEEN BARRICADES IS 8 FEET.

LOW PROFILE BARRICADES SHALL BE PROVIDED BY THE CONTRACTOR AND SHALL BE INSTALLED TO KEEP AIRCRAFT OUT OF THE WORK AREA.

2 LOW PROFILE BARRICADE
NO SCALE

LEGEND:

1. STAGING AREA
2. HAUL ROUTE
3. RUNWAY CLOSURE MARKER
4. LOW-PROFILE BARRICADES
5. XXXXXXXXX COVER EXISTING MARKINGS

HATCH LEGEND:

- WORK AREA 1
- WORK AREA 2

PHASING NOTES:

1. MALSF, LOCALIZER, GLIDESLOPE, PAPIS, LIGHTED WINDCONES, AND REILS NEED TO BE PROTECTED WITH HIGH VISIBILITY PLASTIC FENCE.
2. LOW-PROFILE BARRICADES SHALL BE PLACED AT LEAST 12 FT FROM THE PAVEMENT CONSTRUCTION LIMITS AND OUTSIDE THE SAFETY ZONES AS SHOWN ON THESE PLANS.
3. AN FAA INSPECTOR WILL BE ON-SITE DURING CONSTRUCTION OF THE MALSF SYSTEM (SEE ELECTRICAL PLANS FOR FURTHER DETAILS). THE FAA WILL REQUIRE AT LEAST 30-DAY NOTICE TO SCHEDULE THE INSPECTION. THE CONTRACTOR SHALL ACCOUNT FOR THIS INSPECTION IN THE SCHEDULE AND BE PREPARED TO COORDINATE WITH THE FAA AS NECESSARY.
4. THE PROJECT WILL ALSO REQUIRE A FLIGHT CHECK TO VERIFY THE NAVAIDS ARE INSTALLED/WORKING PROPERLY AT THE END OF CONSTRUCTION PHASE 1. THE CONTRACTOR AND ELECTRICAL SUBCONTRACTOR SHALL BE PRESENT DURING THE FLIGHT CHECK IN CASE ADJUSTMENTS NEED TO BE MADE.

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0 300 600

REGISTERED PROFESSIONAL ENGINEER
JANNET LOERA
C 84900
EXP. 03/31/22
CIVIL
STATE OF CALIFORNIA
Signed: 3-30-21

NOTE: PRINT IN COLOR

△	REVISION	DESCRIPTION	APP.	DATE

PREPARED BY: JLG DATE: FEB 2021

Mead & Hunt
3110 E. Guasti Road, Suite 330
Ontario, California 91761
(909) 467-8560

FILE NAME: 3138400-181115.02

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APPROVED: KIP TURNER, DIRECTOR OF AIRPORTS

RECOMMENDED: ERIN POWERS, PROJECT MANAGER

COUNTY of VENTURA
Department of Airports

SPEC. NO. DOA 20-02

PROJ. NO. OXR-146

CSPP OVERALL — G-100

OXNARD AIRPORT
RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT RECONSTRUCTION

SHEET 7 OF 243

DRAWING NO. 1235-DOA

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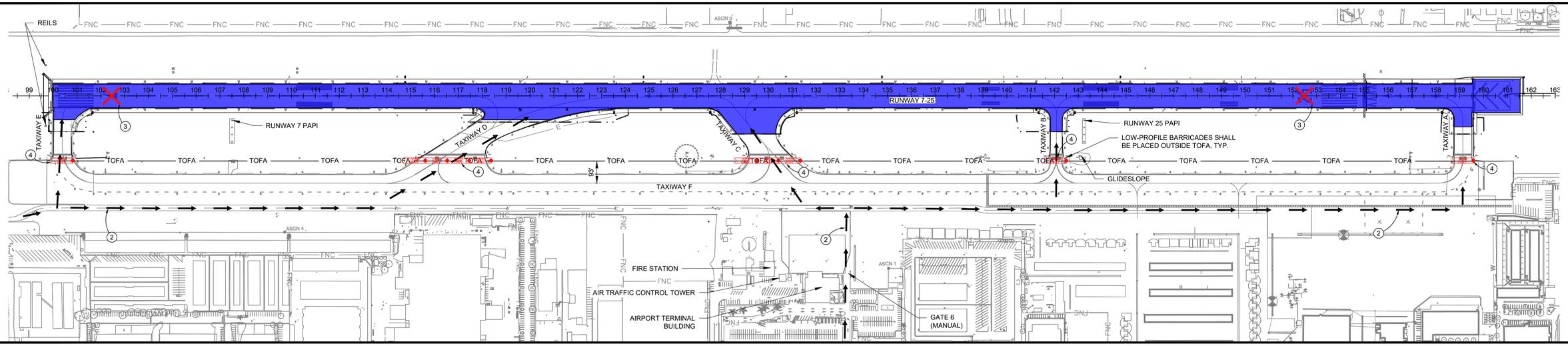

ELEMENT	PHASE	WORK HOURS	WORK DESCRIPTION OF WORK	PAVEMENT CLOSURES	OPERATIONAL THRU TRAFFIC PER WORK AREA	DURATION	TEMPORARY LIGHTING AND MARKING CHANGES	IMPACTS TO NAVAID
MOBILIZATION	1	NOT APPLICABLE	PROCESSING OF ALL SUBMITTALS REQUIRED FOR PROJECT STARTUP PREQUALIFICATION TESTING, REVIEW, AND APPROVAL FOR SUBGRADE STABILIZATION MATERIALS AIRFIELD SAFETY DEVICES DELIVERED/PREPARED AT THE SITE (CONSTRUCTION FLAGS, LOW PROFILE BARRICADES, AIRPORT RADIOS,RUNWAY CLOSURE MARKERS). FURTHER REQUIREMENTS ON EACH OF THESE DEVICES ARE DETAILED IN THE CSPP DOCUMENT AIRFIELD SAFETY DEVICES DELIVERED/PREPARED AT THE SITE MATERIALS AND EQUIPMENTFOR AIRFIELD SAFETY AND TRAFFIC CONTROL, EROSION CONTROL, EARTHWORK AND SUBGRADE STABILIZATION DELIVERED TO SITE ALL PRELIMINARY WORK REQUIRED TO COMMENCE CONSTRUCTION WILL BE FINALIZED DURING THE MOBILIZATION PHASE 1 TO MINIMIZE DELAYS DURING CONSTRUCTION	NOT APPLICABLE	NOT APPLICABLE	14 CALENDAR DAYS	NOT APPLICABLE	NOT APPLICABLE
	2	NOT APPLICABLE	PROCESSING OF ALL REMAINING SUBMITTALS PREQUALIFICATION TESTING, REVIEW, AND APPROVAL FOR REMAINING SUBMITTALS MIX DESIGN PREPARATION, REVIEW, AND APPROVAL MATERIALS AND EQUIPMENT FOR REMAINING WORK ACTIVITIES DELIVERED TO SITE	NOT APPLICABLE	NOT APPICABLE	28 CALENDAR DAYS	NOT APPLICABLE	NOT APPLICABLE
CONSTRUCTION	1	24 HOURS PER DAY, DAILY	PAVEMENT RECONSTRUCTION RUNWAY 7-25 INCLUDING BLAST PAD MILL AND OVERLAY TAXIWAYS A, B, C, D, E INFIELD GRADING ELECTRICAL IMPROVEMENTS MALSF BAR REPLACEMENT STORM DRAIN IMPROVEMENTS INSTALLATION OF NEW UNDERDRAIN SYSTEM INITIAL APPLICATION OF PAVEMENT MARKINGS	RUNWAY 7-25; TAXIWAYS A, B, C, D, E	TAXIWAY F	91 CALENDAR DAYS	ALL RUNWAY AND TAXIWAY CIRCUITS WILL BE POWERED OFF PAVEMENT MARKINGS LEADING TO CLOSED AREAS SHALL BE COVERED	POWERED OFF: RUNWAY 25 MALSF (SEE PHASING NOTE 3) RUNWAY 25 LOCALIZER RUNWAY 25 GLIDESLOPE RUNWAY 25 PAPI RUNWAY 7 PAPI FLIGHT CHECK (SEE PHASING NOTE 4)
	2	10:00 PM TO 6:00 AM, DAILY	PAVEMENT GROOVING OF RUNWAY 7-25 AND TAXIWAY D FINAL APPLICATION OF PAVEMENT MARKINGS	ENTIRE AIRFIELD	NONE	14 CALENDAR DAYS, NIGHT CLOSURE	ALL RUNWAY AND TAXIWAY CIRCUIT WILL BE POWERED OFF BEFORE EACH SHIFT	POWERED OFF: RUNWAY 25 MALSF RUNWAY 25 LOCALIZER RUNWAY 25 GLIDESLOPE RUNWAY 25 PAPI RUNWAY 7 PAPI
POST-CONSTRUCTION	3	NOT APPLICABLE	ONCE CONSTRUCTION IS SUBSTANTIALLY COMPLETE, THE RPR AND THE AGENCY WILL CONDUCT A FINAL INSPECTION IN ACCORDANCE WITH SECTION 50-15 OF THE FAA GENERAL CONTRACT PROVISIONS, INCLUDED AS PART 1 OF THE FAA STANDARD SPECIFICATIONS. IN ORDER TO ACHIEVE FINAL ACCEPTANCE, THE CONTRACTOR SHALL COMPLETE ALL PUNCH LIST ITEMS IDENTIFIED IN THE FINAL INSPECTION, COMPLETE FINAL CLEANUP IN ACCORDANCE WITH SECTION 40-08 OF THE FAA GENERAL CONTRACT PROVISIONS, AND PROVIDE WARRANTIES, OPERATIONS & MAINTENANCE MANUALS, AND OTHER FINAL PROJECT DOCUMENTATION AND ACTIONS IN ACCORDANCE WITH SECTIONS 90-10 AND 90-11 OF THE FAA GENERAL CONTRACT PROVISIONS. THESE ITEMS SHALL BE COMPLETED NO LATER THAN 30 CALENDAR DAYS AFTER THE DATE OF THE FINAL INSPECTION. AFTER FINAL ACCEPTANCE, THE CONTRACTOR SHALL COMPLETE PROJECT CLOSEOUT REQUIREMENTS, WHICH INCLUDE BUT ARE NOT LIMITED TO PROVIDING AFFIDAVITS OF PAYMENTS, CONFIRMING RECEIPT OF FINAL PAYMENT, AND RELEASE OF PERFORMANCE BONDS AND ESCROW ACCOUNTS.	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE

LEGEND:

1. STAGING AREA
2. HAUL ROUTE
3. RUNWAY CLOSURE MARKER
4. LOW-PROFILE BARRICADES

HATCH LEGEND:

WORK AREA 1

PHASING NOTES:

1. MALSF, LOCALIZER, GLIDESLOPE, PAPIS, LIGHTED WINDCONES, AND REILS NEED TO BE PROTECTED WITH HIGH VISIBILITY PLASTIC FENCE.
2. LOW-PROFILE BARRICADES SHALL BE PLACED AT LEAST 12 FT FROM THE PAVEMENT CONSTRUCTION LIMITS AND OUTSIDE THE SAFETY ZONES AS SHOWN ON THESE PLANS.
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4. THE PROJECT WILL ALSO REQUIRE A FLIGHT CHECK TO VERIFY THE NAVAIDS ARE INSTALLED/WORKING PROPERLY AT THE END OF CONSTRUCTION PHASE 1. THE CONTRACTOR AND ELECTRICAL SUBCONTRACTOR SHALL BE PRESENT DURING THE FLIGHT CHECK IN CASE ADJUSTMENTS NEED TO BE MADE.

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REGISTERED PROFESSIONAL ENGINEER JANNET LOERA C 84900 EXP. 03/31/22 CIVIL STATE OF CALIFORNIA

Signed: 3-30-21

NOTE: PRINT IN COLOR

△	REVISION	DESCRIPTION	APP.	DATE

PREPARED BY: JLG DATE: MAR 2021

Mead & Hunt

3110 E. Guasti Road, Suite 330
Ontario, California 91761
(909) 467-8560

FILE NAME: 3138400-181115.02

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APPROVED: KIP TURNER, DIRECTOR OF AIRPORTS

RECOMMENDED: ERIN POWERS, PROJECT MANAGER

COUNTY of VENTURA
Department of Airports

SPEC. NO. DOA 20-02

PROJ. NO. OXR-146

CSPP-BASE BID

G-101

OXNARD AIRPORT

RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT RECONSTRUCTION

SHEET 8 OF 243

DRAWING NO. 1236-DOA

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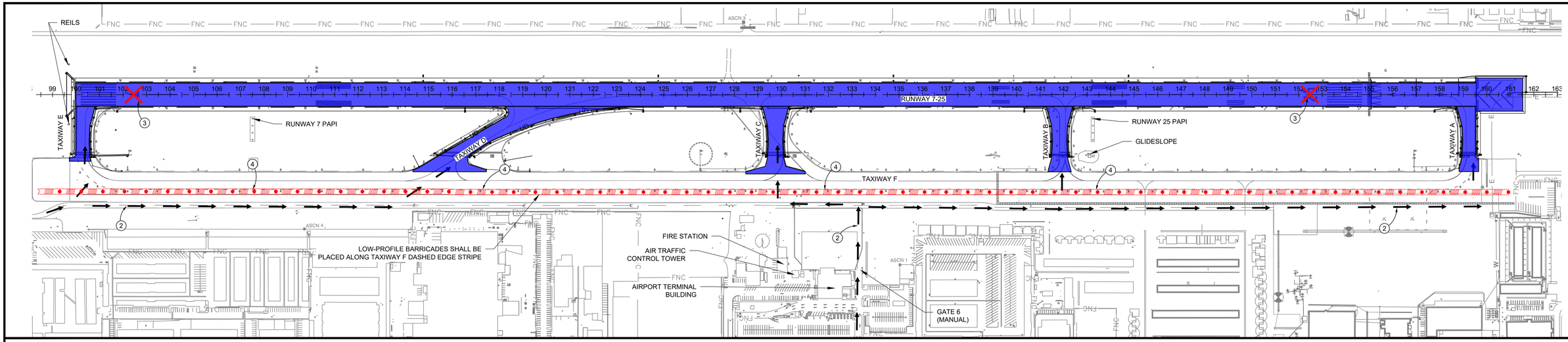

ELEMENT	PHASE	WORK HOURS	DESCRIPTION OF WORK	PAVEMENT CLOSURES	OPERATIONAL THRU TRAFFIC PER WORK AREA	DURATION	TEMPORARY LIGHTING AND MARKING CHANGES	IMPACTS TO NAVAID
MOBILIZATION	1	NOT APPLICABLE	PROCESSING OF ALL SUBMITTALS REQUIRED FOR PROJECT STARTUP PREQUALIFICATION TESTING, REVIEW, AND APPROVAL FOR SUBGRADE STABILIZATION MATERIALS AIRFIELD SAFETY DEVICES DELIVERED/PREPARED AT THE SITE (CONSTRUCTION FLAGS, LOW PROFILE BARRICADES, AIRPORT RADIOS,RUNWAY CLOSURE MARKERS). FURTHER REQUIREMENTS ON EACH OF THESE DEVICES ARE DETAILED IN THE CSPP DOCUMENT AIRFIELD SAFETY DEVICES DELIVERED/PREPARED AT THE SITE MATERIALS AND EQUIPMENTFOR AIRFIELD SAFETY AND TRAFFIC CONTROL, EROSION CONTROL, EARTHWORK AND SUBGRADE STABILIZATION DELIVERED TO SITE ALL PRELIMINARY WORK REQUIRED TO COMMENCE CONSTRUCTION WILL BE FINALIZED DURING THE MOBILIZATION PHASE 1 TO MINIMIZE DELAYS DURING CONSTRUCTION	NOT APPLICABLE	NOT APPLICABLE	14 CALENDAR DAYS	NOT APPLICABLE	NOT APPLICABLE
	2	NOT APPLICABLE	PROCESSING OF ALL REMAINING SUBMITTALS PREQUALIFICATION TESTING, REVIEW, AND APPROVAL FOR REMAINING SUBMITTALS MIX DESIGN PREPARATION, REVIEW, AND APPROVAL MATERIALS AND EQUIPMENT FOR REMAINING WORK ACTIVITIES DELIVERED TO SITE	NOT APPLICABLE	NOT APPICABLE	28 CALENDAR DAYS	NOT APPLICABLE	NOT APPLICABLE
CONSTRUCTION	1	24 HOURS PER DAY, DAILY	PAVEMENT RECONSTRUCTION RUNWAY 7-25, BLAST PAD, AND TAXIWAYS A, B, C, D, E INFIELD GRADING ELECTRICAL IMPROVEMENTS MALSF BAR REPLACEMENT STORM DRAIN IMPROVEMENTS INSTALLATION OF NEW UNDERDRAIN IMPROVEMENTS INITIAL APPLICATION OF PAVEMENT MARKINGS	RUNWAY 7-25; TAXIWAYS A, B, C, D, E, F	NONE	98 CALENDAR DAYS	ALL RUNWAY AND TAXIWAY CIRCUITS WILL BE POWERED OFF PAVEMENT MARKINGS LEADING TO CLOSED AREAS SHALL BE COVERED	POWER OFF: RUNWAY 25 MALSF (SEE PHASING NOTE 3) RUNWAY 25 LOCALIZER RUNWAY 25 GLIDESLOPE RUNWAY 25 PAPI RUNWAY 7 PAPI FLIGHT CHECK (SEE PHASING NOTE 4)
	2	10:00 PM TO 6:00 AM, DAILY	PAVEMENT GROOVING OF RUNWAY 7-25 AND TAXIWAY D FINAL APPLICATION OF PAVEMENT MARKINGS	ENTIRE AIRFIELD	NONE	14 CALENDAR DAYS, NIGHT CLOSURE	ALL RUNWAY AND TAXIWAY CIRCUIT WILL BE POWERED OFF BEFORE EACH SHIFT	POWER OFF: RUNWAY 25 MALSF RUNWAY 25 LOCALIZER RUNWAY 25 GLIDESLOPE RUNWAY 25 PAPI RUNWAY 7 PAPI
POST-CONSTRUCTION	3	NOT APPLICABLE	ONCE CONSTRUCTION IS SUBSTANTIALLY COMPLETE, THE RPR AND THE AGENCY WILL CONDUCT A FINAL INSPECTION IN ACCORDANCE WITH SECTION 50-15 OF THE FAA GENERAL CONTRACT PROVISIONS, INCLUDED AS PART 1 OF THE FAA STANDARD SPECIFICATIONS. IN ORDER TO ACHIEVE FINAL ACCEPTANCE, THE CONTRACTOR SHALL COMPLETE ALL PUNCH LIST ITEMS IDENTIFIED IN THE FINAL INSPECTION, COMPLETE FINAL CLEANUP IN ACCORDANCE WITH SECTION 40-08 OF THE FAA GENERAL CONTRACT PROVISIONS, AND PROVIDE WARRANTIES, OPERATIONS & MAINTENANCE MANUALS, AND OTHER FINAL PROJECT DOCUMENTATION AND ACTIONS IN ACCORDANCE WITH SECTIONS 90-10 AND 90-11 OF THE FAA GENERAL CONTRACT PROVISIONS. THESE ITEMS SHALL BE COMPLETED NO LATER THAN 30 CALENDAR DAYS AFTER THE DATE OF THE FINAL INSPECTION. AFTER FINAL ACCEPTANCE, THE CONTRACTOR SHALL COMPLETE PROJECT CLOSEOUT REQUIREMENTS, WHICH INCLUDE BUT ARE NOT LIMITED TO PROVIDING AFFIDAVITS OF PAYMENTS, CONFIRMING RECEIPT OF FINAL PAYMENT, AND RELEASE OF PERFORMANCE BONDS AND ESCROW ACCOUNTS.	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE

LEGEND:

1. STAGING AREA
2. HAUL ROUTE
3. RUNWAY CLOSURE MARKER
4. LOW-PROFILE BARRICADES
5. XXXXXXXXX COVER EXISTING MARKINGS

HATCH LEGEND:

WORK AREA 1

PHASING NOTES:

1. MALSF, LOCALIZER, GLIDESLOPE, PAPIS, LIGHTED WINDCONES, AND REILS NEED TO BE PROTECTED WITH HIGH VISIBILITY PLASTIC FENCE.
2. LOW-PROFILE BARRICADES SHALL BE PLACED AT LEAST 12 FT FROM THE PAVEMENT CONSTRUCTION LIMITS AND OUTSIDE THE SAFETY ZONES AS SHOWN ON THESE PLANS.
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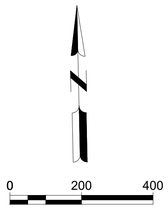
4. THE PROJECT WILL ALSO REQUIRE A FLIGHT CHECK TO VERIFY THE NAVAIDS ARE INSTALLED/WORKING PROPERLY AT THE END OF CONSTRUCTION PHASE 1. THE CONTRACTOR AND ELECTRICAL SUBCONTRACTOR SHALL BE PRESENT DURING THE FLIGHT CHECK IN CASE ADJUSTMENTS NEED TO BE MADE.



REGISTERED PROFESSIONAL ENGINEER
JANNET LOERA
C 84900
EXP. 03/31/22
CIVIL
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PREPARED BY: JLG DATE: FEB 2021

Mead & Hunt
3110 E. Guasti Road, Suite 330
Ontario, California 91761
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APPROVED: KIP TURNER, DIRECTOR OF AIRPORTS
RECOMMENDED: ERIN POWERS, PROJECT MANAGER

COUNTY of VENTURA
Department of Airports

SPEC. NO. DOA 20-02
PROJ. NO. OXR-146

CSPP-BID ALT I

OXNARD AIRPORT
RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT RECONSTRUCTION

G-102
SHEET 9 OF 243
DRAWING NO. 1237-DOA

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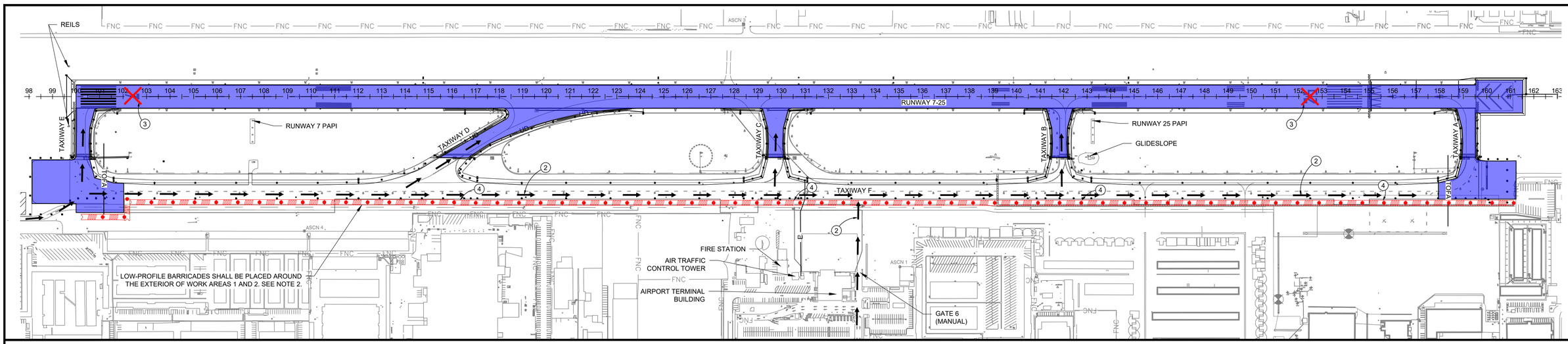

ELEMENT	PHASE	WORK HOURS	DESCRIPTION OF WORK	PAVEMENT CLOSURES	OPERATIONAL THRU TRAFFIC PER WORK AREA	DURATION	TEMPORARY LIGHTING AND MARKING CHANGES	IMPACTS TO NAVAID
MOBILIZATION	1	NOT APPLICABLE	PROCESSING OF ALL SUBMITTALS REQUIRED FOR PROJECT STARTUP PREQUALIFICATION TESTING, REVIEW, AND APPROVAL FOR SUBGRADE STABILIZATION MATERIALS AIRFIELD SAFETY DEVICES DELIVERED/PREPARED AT THE SITE (CONSTRUCTION FLAGS, LOW PROFILE BARRICADES, AIRPORT RADIOS,RUNWAY CLOSURE MARKERS). FURTHER REQUIREMENTS ON EACH OF THESE DEVICES ARE DETAILED IN THE CSPP DOCUMENT AIRFIELD SAFETY DEVICES DELIVERED/PREPARED AT THE SITE MATERIALS AND EQUIPMENTFOR AIRFIELD SAFETY AND TRAFFIC CONTROL, EROSION CONTROL, EARTHWORK AND SUBGRADE STABILIZATION DELIVERED TO SITE ALL PRELIMINARY WORK REQUIRED TO COMMENCE CONSTRUCTION WILL BE FINALIZED DURING THE MOBILIZATION PHASE 1 TO MINIMIZE DELAYS DURING CONSTRUCTION	NOT APPLICABLE	NOT APPLICABLE	14 CALENDAR DAYS	NOT APPLICABLE	NOT APPLICABLE
	2	NOT APPLICABLE	PROCESSING OF ALL REMAINING SUBMITTALS PREQUALIFICATION TESTING, REVIEW, AND APPROVAL FOR REMAINING SUBMITTALS MIX DESIGN PREPARATION, REVIEW, AND APPROVAL MATERIALS AND EQUIPMENT FOR REMAINING WORK ACTIVITIES DELIVERED TO SITE	NOT APPLICABLE	NOT APPICABLE	28 CALENDAR DAYS	NOT APPLICABLE	NOT APPLICABLE
CONSTRUCTION	1	24 HOURS PER DAY, DAILY	PAVEMENT RECONSTRUCTION RUNWAY 7-25 AND TAXIWAYS A, B, C, D, E, & F MILL AND OVERLAY OF RUN-UP APRONS INFIELD GRADING ELECTRICAL IMPROVEMENTS MALSF BAR REPLACEMENT STORM DRAIN IMPROVEMENTS INSTALLATION OF NEW UNDERDRAIN SYSTEM INITIAL APPLICATION OF PAVEMENT MARKINGS (DON'T PAINT TWY B, C, & D LEAD IN-LINES)	WA 1: RUNWAY 7-25; TAXIWAYS A, B, C, D, E WA 2: TAXIWAYS B, C, D, F	WA 1: NONE WA 2: RUNWAY 7-25; TAXIWAY A, E (AFTER 98 DAYS)	WA 1: 98 CALENDAR DAYS WA 2 : 105 CALENDAR DAYS	WA 1: ALL RUNWAY AND TAXIWAY CIRCUITS WILL BE POWERED OFF WA 2: RUNWAY 7-25 CIRCUIT WILL BE POWERED ON DURING OPERATIONAL PERIOD OF 7 CALENDAR DAYS PAVEMENT MARKINGS LEADING TO CLOSED AREAS WILL BE COVERED	POWER OFF: RUNWAY 25 MALSF (SEE PHASING NOTE 3) RUNWAY 25 LOCALIZER RUNWAY 25 GLIDESLOPE RUNWAY 25 PAPI RUNWAY 7 PAPI FLIGHT CHECK (SEE PHASING NOTE 4)
	2	10:00 PM TO 6:00 AM, DAILY	PAVEMENT GROOVING OF RUNWAY 7-25 AND TAXIWAY D FINAL APPLICATION OF PAVEMENT MARKINGS	ENTIRE AIRFIELD	NONE	14 CALENDAR DAYS, NIGHT CLOSURE	ALL RUNWAY AND TAXIWAY CIRCUIT WILL BE POWERED OFF BEFORE EACH SHIFT	POWER OFF AND TURN ON EVERY SHIFT: RUNWAY 25 MALSF RUNWAY 25 LOCALIZER RUNWAY 25 GLIDESLOPE RUNWAY 25 PAPI RUNWAY 7 PAPI
POST-CONSTRUCTION	1	NOT APPLICABLE	ONCE CONSTRUCTION IS SUBSTANTIALLY COMPLETE, THE RPR AND THE AGENCY WILL CONDUCT A FINAL INSPECTION IN ACCORDANCE WITH SECTION 50-15 OF THE FAA GENERAL CONTRACT PROVISIONS, INCLUDED AS PART 1 OF THE FAA STANDARD SPECIFICATIONS. IN ORDER TO ACHIEVE FINAL ACCEPTANCE, THE CONTRACTOR SHALL COMPLETE ALL PUNCH LIST ITEMS IDENTIFIED IN THE FINAL INSPECTION, COMPLETE FINAL CLEANUP IN ACCORDANCE WITH SECTION 40-08 OF THE FAA GENERAL CONTRACT PROVISIONS, AND PROVIDE WARRANTIES, OPERATIONS & MAINTENANCE MANUALS, AND OTHER FINAL PROJECT DOCUMENTATION AND ACTIONS IN ACCORDANCE WITH SECTIONS 90-10 AND 90-11 OF THE FAA GENERAL CONTRACT PROVISIONS. THESE ITEMS SHALL BE COMPLETED NO LATER THAN 30 CALENDAR DAYS AFTER THE DATE OF THE FINAL INSPECTION. AFTER FINAL ACCEPTANCE, THE CONTRACTOR SHALL COMPLETE PROJECT CLOSEOUT REQUIREMENTS, WHICH INCLUDE BUT ARE NOT LIMITED TO PROVIDING AFFIDAVITS OF PAYMENTS, CONFIRMING RECEIPT OF FINAL PAYMENT, AND RELEASE OF PERFORMANCE BONDS AND ESCROW ACCOUNTS.	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE

LEGEND:

1. STAGING AREA
2. HAUL ROUTE
3. RUNWAY CLOSURE MARKER
4. LOW-PROFILE BARRICADES

HATCH LEGEND:

- WORK AREA 1
- WORK AREA 2

PHASING NOTES:

1. MALSF, LOCALIZER, GLIDESLOPE, PAPIS, LIGHTED WINDCONES, AND REILS NEED TO BE PROTECTED WITH HIGH VISIBILITY PLASTIC FENCE.
2. LOW-PROFILE BARRICADES SHALL BE PLACED AT LEAST 12 FT FROM THE PAVEMENT CONSTRUCTION LIMITS AND OUTSIDE THE SAFETY ZONES AS SHOWN ON THESE PLANS.
3. AN FAA INSPECTOR WILL BE ON-SITE DURING CONSTRUCTION OF THE MALSF SYSTEM (SEE ELECTRICAL PLANS FOR FURTHER DETAILS). THE FAA WILL REQUIRE AT LEAST 30-DAY NOTICE TO SCHEDULE THE INSPECTION. THE CONTRACTOR SHALL ACCOUNT FOR THIS INSPECTION IN THE SCHEDULE AND BE PREPARED TO COORDINATE WITH THE FAA AS NECESSARY.
4. THE PROJECT WILL ALSO REQUIRE A FLIGHT CHECK TO VERIFY THE NAVAIDS ARE INSTALLED/WORKING PROPERLY AT THE END OF CONSTRUCTION PHASE 1. THE CONTRACTOR AND ELECTRICAL SUBCONTRACTOR SHALL BE PRESENT DURING THE FLIGHT CHECK IN CASE ADJUSTMENTS NEED TO BE MADE.
5. THE LIMITS OF WORK AREA 2 ON TAXIWAYS D, E, AND F SHALL BE LOCATED SUCH THAT ALL WORK IS PERFORMED OUTSIDE OF THE RSA WITH BARRICADE CLEARANCE AS DEFINED IN NOTE 2.

0 200 400

REGISTERED PROFESSIONAL ENGINEER JANNET LOERA C 84900 EXP. 03/31/22 CIVIL STATE OF CALIFORNIA
Signed: 3-30-21

NOTE: PRINT IN COLOR

REVISION	DESCRIPTION	APP.	DATE
4			

PREPARED BY: JLG DATE: MAR 2021

Mead & Hunt
3110 E. Guasti Road, Suite 330
Ontario, California 91761
(909) 467-8560
FILE NAME: 3138400--181115.02

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APPROVED: KIP TURNER, DIRECTOR OF AIRPORTS
RECOMMENDED: ERIN POWERS, PROJECT MANAGER

COUNTY of VENTURA
Department of Airports

SPEC. NO. DOA 20-02
PROJ. NO. OXR-146

CSPP-BID ALT 2 (WORK AREA 1)

OXNARD AIRPORT
RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT RECONSTRUCTION

G-103
SHEET 10 OF 243
DRAWING NO. 1238-DOA

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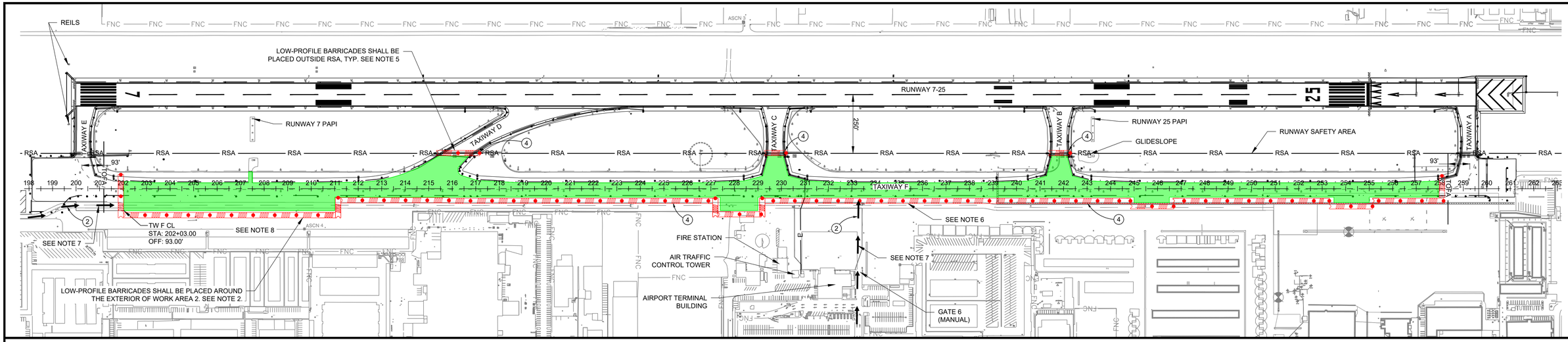

ELEMENT	PHASE	WORK HOURS	DESCRIPTION OF WORK	PAVEMENT CLOSURES	OPERATIONAL THRU TRAFFIC PER WORK AREA	DURATION	TEMPORARY LIGHTING AND MARKING CHANGES	IMPACTS TO NAVAID
MOBILIZATION	1	NOT APPLICABLE	PROCESSING OF ALL SUBMITTALS REQUIRED FOR PROJECT STARTUP PREQUALIFICATION TESTING, REVIEW, AND APPROVAL FOR SUBGRADE STABILIZATION MATERIALS AIRFIELD SAFETY DEVICES DELIVERED/PREPARED AT THE SITE (CONSTRUCTION FLAGS, LOW PROFILE BARRICADES, AIRPORT RADIOS,RUNWAY CLOSURE MARKERS). FURTHER REQUIREMENTS ON EACH OF THESE DEVICES ARE DETAILED IN THE CSPP DOCUMENT AIRFIELD SAFETY DEVICES DELIVERED/PREPARED AT THE SITE MATERIALS AND EQUIPMENTFOR AIRFIELD SAFETY AND TRAFFIC CONTROL, EROSION CONTROL, EARTHWORK AND SUBGRADE STABILIZATION DELIVERED TO SITE ALL PRELIMINARY WORK REQUIRED TO COMMENCE CONSTRUCTION WILL BE FINALIZED DURING THE MOBILIZATION PHASE 1 TO MINIMIZE DELAYS DURING CONSTRUCTION	NOT APPLICABLE	NOT APPLICABLE	14 CALENDAR DAYS	NOT APPLICABLE	NOT APPLICABLE
	2	NOT APPLICABLE	PROCESSING OF ALL REMAINING SUBMITTALS PREQUALIFICATION TESTING, REVIEW, AND APPROVAL FOR REMAINING SUBMITTALS MIX DESIGN PREPARATION, REVIEW, AND APPROVAL MATERIALS AND EQUIPMENT FOR REMAINING WORK ACTIVITIES DELIVERED TO SITE	NOT APPLICABLE	NOT APPICABLE	28 CALENDAR DAYS	NOT APPLICABLE	NOT APPLICABLE
CONSTRUCTION	1	24 HOURS PER DAY, DAILY	PAVEMENT RECONSTRUCTION RUNWAY 7-25 AND TAXIWAYS A, B, C, D, E, & F MILL AND OVERLAY OF RUN-UP APRONS INFIELD GRADING ELECTRICAL IMPROVEMENTS MALSF BAR REPLACEMENT STORM DRAIN IMPROVEMENTS INSTALLATION OF NEW UNDERDRAIN SYSTEM INITIAL APPLICATION OF PAVEMENT MARKINGS	WA 1: RUNWAY 7-25; TAXIWAYS A, B, C, D, E WA 2: TAXIWAYS B, C, D, F	WA 1: NONE WA 2: RUNWAY 7-25; TAXIWAY A, E (AFTER 98 DAYS)	WA 1: 98 CALENDAR DAYS WA 2 : 105 CALENDAR DAYS	WA 1: ALL RUNWAY AND TAXIWAY CIRCUITS WILL BE POWERED OFF WA 2: RUNWAY 7-25 CIRCUIT WILL BE POWERED ON DURING OPERATIONAL PERIOD OF 7 CALENDAR DAYS PAVEMENT MARKINGS LEADING TO CLOSED AREAS WILL BE COVERED	POWER OFF: RUNWAY 25 MALSF (SEE PHASING NOTE 3) RUNWAY 25 LOCALIZER RUNWAY 25 GLIDESLOPE RUNWAY 25 PAPI RUNWAY 7 PAPI FLIGHT CHECK (SEE PHASING NOTE 4)
	2	10:00 PM TO 6:00 AM, DAILY	PAVEMENT GROOVING OF RUNWAY 7-25 AND TAXIWAY D FINAL APPLICATION OF PAVEMENT MARKINGS	ENTIRE AIRFIELD	NONE	14 CALENDAR DAYS, NIGHT CLOSURE	ALL RUNWAY AND TAXIWAY CIRCUIT WILL BE POWERED OFF BEFORE EACH SHIFT	POWER OFF AND TURN ON EVERY SHIFT: RUNWAY 25 MALSF RUNWAY 25 LOCALIZER RUNWAY 25 GLIDESLOPE RUNWAY 25 PAPI RUNWAY 7 PAPI
POST-CONSTRUCTION	1	NOT APPLICABLE	ONCE CONSTRUCTION IS SUBSTANTIALLY COMPLETE, THE RPR AND THE AGENCY WILL CONDUCT A FINAL INSPECTION IN ACCORDANCE WITH SECTION 50-15 OF THE FAA GENERAL CONTRACT PROVISIONS, INCLUDED AS PART 1 OF THE FAA STANDARD SPECIFICATIONS. IN ORDER TO ACHIEVE FINAL ACCEPTANCE, THE CONTRACTOR SHALL COMPLETE ALL PUNCH LIST ITEMS IDENTIFIED IN THE FINAL INSPECTION, COMPLETE FINAL CLEANUP IN ACCORDANCE WITH SECTION 40-08 OF THE FAA GENERAL CONTRACT PROVISIONS, AND PROVIDE WARRANTIES, OPERATIONS & MAINTENANCE MANUALS, AND OTHER FINAL PROJECT DOCUMENTATION AND ACTIONS IN ACCORDANCE WITH SECTIONS 90-10 AND 90-11 OF THE FAA GENERAL CONTRACT PROVISIONS. THESE ITEMS SHALL BE COMPLETED NO LATER THAN 30 CALENDAR DAYS AFTER THE DATE OF THE FINAL INSPECTION. AFTER FINAL ACCEPTANCE, THE CONTRACTOR SHALL COMPLETE PROJECT CLOSEOUT REQUIREMENTS, WHICH INCLUDE BUT ARE NOT LIMITED TO PROVIDING AFFIDAVITS OF PAYMENTS, CONFIRMING RECEIPT OF FINAL PAYMENT, AND RELEASE OF PERFORMANCE BONDS AND ESCROW ACCOUNTS.	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE

LEGEND:

1. STAGING AREA
2. HAUL ROUTE
3. RUNWAY CLOSURE MARKER
4. LOW-PROFILE BARRICADES

HATCH LEGEND:

- WORK AREA 1
- WORK AREA 2

PHASING NOTES:

1. MALSF, LOCALIZER, GLIDESLOPE, PAPIS, LIGHTED WINDCONES, AND REILS NEED TO BE PROTECTED WITH HIGH VISIBILITY PLASTIC FENCE.
2. LOW-PROFILE BARRICADES SHALL BE PLACED AT LEAST 12 FT FROM THE PAVEMENT CONSTRUCTION LIMITS AND OUTSIDE THE SAFETY ZONES AS SHOWN ON THESE PLANS.
3. AN FAA INSPECTOR WILL BE ON-SITE DURING CONSTRUCTION OF THE MALSF SYSTEM (SEE ELECTRICAL PLANS FOR FURTHER DETAILS). THE FAA WILL REQUIRE AT LEAST 30-DAY NOTICE TO SCHEDULE THE INSPECTION. THE CONTRACTOR SHALL ACCOUNT FOR THIS INSPECTION IN THE SCHEDULE AND BE PREPARED TO COORDINATE WITH THE FAA AS NECESSARY.
4. THE PROJECT WILL ALSO REQUIRE A FLIGHT CHECK TO VERIFY THE NAVAIDS ARE INSTALLED/WORKING PROPERLY AT THE END OF CONSTRUCTION PHASE 1. THE CONTRACTOR AND ELECTRICAL SUBCONTRACTOR SHALL BE PRESENT DURING THE FLIGHT CHECK IN CASE ADJUSTMENTS NEED TO BE MADE.
5. THE LIMITS OF WORK AREA 2 ON TAXIWAYS D, E, AND F SHALL BE LOCATED SUCH THAT ALL WORK IS PERFORMED OUTSIDE OF THE RSA WITH BARRICADE CLEARANCE AS DEFINED IN NOTE 2.
6. REMOVAL AND APPLICATION OF PAVEMENT MARKINGS OUTSIDE OF RECONSTRUCTION LIMITS SHALL BE COORDINATED WITH THE AIRPORT AND/OR RPR AND PERFORMED ON A PULL-BACK BASIS.
7. CONTRACTOR SHALL PROVIDE DEDICATED FLAGGERS FOR THE 7 CALENDAR DAYS THAT RUNWAY 7-25 IS OPERATIONAL. THE FLAGGER SHALL COMMUNICATE WITH THE AIR TRAFFIC CONTROL TOWER TO PREVENT CONSTRUCTION VEHICLES FROM CROSSING TAXIWAY E WHILE AIRCRAFT ARE TAXIING. THE FLAGGER SHALL COORDINATE WITH THE AIRPORT AND/OR RPR ON THE REQUIRED PROTOCOLS FOR THE TOWER COMMUNICATION. A SWEEPER SHALL BE READILY AVAILABLE TO CLEAN FOD FROM THE AREA BEFORE AIRCRAFT TAXI THROUGH. IF THE HAUL ROUTE VIA GATE 6 IS USED, A SEPARATE FLAGGER SHALL BE POSITIONED IN THIS LOCATION AS WELL.
8. PLANES TRAVERSING THE AREA SOUTH OF THE CONSTRUCTION LIMITS WILL HAVE TO BE TUGGED.

0 200 400

REGISTERED PROFESSIONAL ENGINEER JANNET LOERA C 84900 CIVIL EXP. 03/31/22 STATE OF CALIFORNIA
Signed: 3-30-21

NOTE: PRINT IN COLOR

△	REVISION	DESCRIPTION	APP.	DATE

PREPARED BY: JLG DATE: MAR 2021

Mead & Hunt
3110 E. Guasti Road, Suite 330
Ontario, California 91761
(909) 467-8560
FILE NAME: 3138400--181115.02

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APPROVED: KIP TURNER, DIRECTOR OF AIRPORTS
RECOMMENDED: ERIN POWERS, PROJECT MANAGER

COUNTY of VENTURA
Department of Airports

SPEC. NO. DOA 20-02
PROJ. NO. OXR-146

CSPP-BID ALT 2 (WORK AREA 2)

OXNARD AIRPORT
RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT RECONSTRUCTION

G-104
SHEET 11 OF 243
DRAWING NO. 1239-DOA

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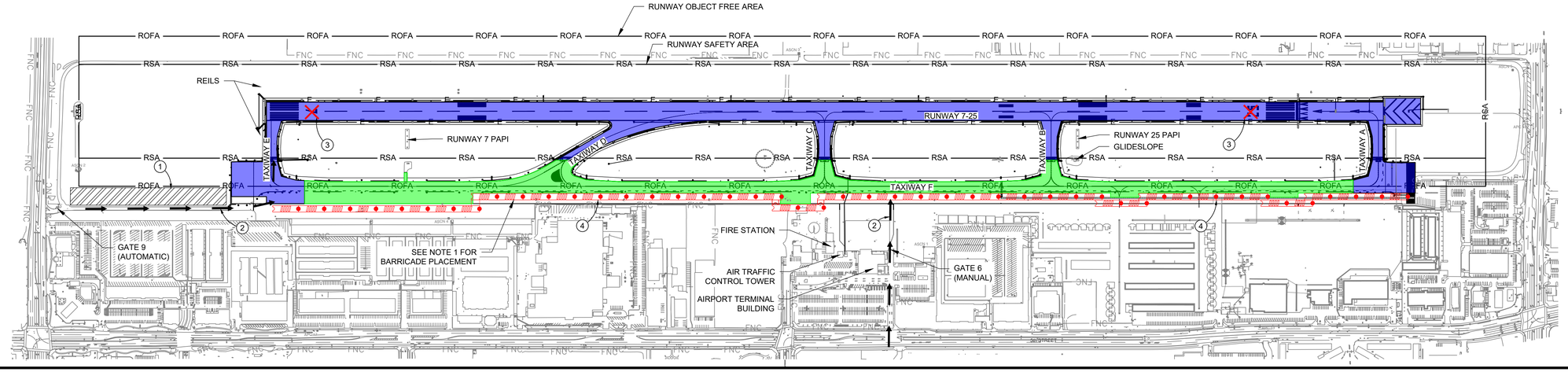

ELEMENT	PHASE	WORK HOURS	DESCRIPTION OF WORK	PAVEMENT CLOSURES	OPERATIONAL THRU TRAFFIC PER WORK AREA	DURATION	TEMPORARY LIGHTING AND MARKING CHANGES	IMPACTS TO NAVAID
MOBILIZATION	1	NOT APPLICABLE	PROCESSING OF ALL SUBMITTALS REQUIRED FOR PROJECT STARTUP PREQUALIFICATION TESTING, REVIEW, AND APPROVAL FOR SUBGRADE STABILIZATION MATERIALS AIRFIELD SAFETY DEVICES DELIVERED/PREPARED AT THE SITE (CONSTRUCTION FLAGS, LOW PROFILE BARRICADES, AIRPORT RADIOS,RUNWAY CLOSURE MARKERS). FURTHER REQUIREMENTS ON EACH OF THESE DEVICES ARE DETAILED IN THE CSPP DOCUMENT AIRFIELD SAFETY DEVICES DELIVERED/PREPARED AT THE SITE MATERIALS AND EQUIPMENTFOR AIRFIELD SAFETY AND TRAFFIC CONTROL, EROSION CONTROL, EARTHWORK AND SUBGRADE STABILIZATION DELIVERED TO SITE ALL PRELIMINARY WORK REQUIRED TO COMMENCE CONSTRUCTION WILL BE FINALIZED DURING THE MOBILIZATION PHASE 1 TO MINIMIZE DELAYS DURING CONSTRUCTION	NOT APPLICABLE	NOT APPLICABLE	14 CALENDAR DAYS	NOT APPLICABLE	NOT APPLICABLE
	2	NOT APPLICABLE	PROCESSING OF ALL REMAINING SUBMITTALS PREQUALIFICATION TESTING, REVIEW, AND APPROVAL FOR REMAINING SUBMITTALS MIX DESIGN PREPARATION, REVIEW, AND APPROVAL MATERIALS AND EQUIPMENT FOR REMAINING WORK ACTIVITIES DELIVERED TO SITE	NOT APPLICABLE	NOT APPICABLE	28 CALENDAR DAYS	NOT APPLICABLE	NOT APPLICABLE
CONSTRUCTION	1	24 HOURS PER DAY, DAILY	PAVEMENT RECONSTRUCTION RUNWAY 7-25 AND TAXIWAYS A, B, C, D, E, & F MILL AND OVERLAY OF RUN-UP APRONS INFIELD GRADING ELECTRICAL IMPROVEMENTS MALSF BAR REPLACEMENT STORM DRAIN IMPROVEMENTS INSTALLATION OF NEW UNDERDRAIN SYSTEM INITIAL APPLICATION OF PAVEMENT MARKINGS	WA 1: RUNWAY 7-25; TAXIWAYS A, B, C, D, E WA 2: TAXIWAYS B, C, D, F	WA 1: NONE WA 2: RUNWAY 7-25; TAXIWAY A, E (AFTER 98 DAYS)	WA 1: 98 CALENDAR DAYS WA 2 : 105 CALENDAR DAYS	WA 1: ALL RUNWAY AND TAXIWAY CIRCUITS WILL BE POWERED OFF WA 2: RUNWAY 7-25 CIRCUIT WILL BE POWERED ON DURING OPERATIONAL PERIOD OF 7 CALENDAR DAYS PAVEMENT MARKINGS LEADING TO CLOSED AREAS WILL BE COVERED	POWER OFF: RUNWAY 25 MALSF (SEE PHASING NOTE 3) RUNWAY 25 LOCALIZER RUNWAY 25 GLIDESLOPE RUNWAY 25 PAPI RUNWAY 7 PAPI FLIGHT CHECK (SEE PHASING NOTE 4)
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LEGEND:

1. STAGING AREA
2. HAUL ROUTE
3. RUNWAY CLOSURE MARKER
4. LOW-PROFILE BARRICADES

HATCH LEGEND:

- WORK AREA 1
- WORK AREA 2

PHASING NOTES:

1. CONTRACTOR SHALL COORDINATE WITH AIRPORT AND/OR RPR TO PLACE BARRICADES AT THE BEGINNING OF EVERY SHIFT AND REMOVE AT THE END OF EVERY SHIFT. THE LOCATION OF BARRICADES SHALL BE COORDINATED WITH THE AIRPORT AND/OR RPR BASED ON THE AREA WHERE WORK ACTIVITIES WILL BE CONTAINED FOR ANY GIVEN SHIFT.

0 300 600

NOTE: PRINT IN COLOR

REGISTERED PROFESSIONAL ENGINEER
JANNET LOERA
C 84900
EXP. 03/31/22
CIVIL
STATE OF CALIFORNIA
Signed: 3-30-21

△	REVISION	DESCRIPTION	APP.	DATE

PREPARED BY: JLG DATE: MAR 2021

Mead & Hunt
3110 E. Guasti Road, Suite 330
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APPROVED: KIP TURNER, DIRECTOR OF AIRPORTS

RECOMMENDED: ERIN POWERS, PROJECT MANAGER

COUNTY of VENTURA
Department of Airports

SPEC. NO. DOA 20-02

PROJ. NO. OXR-146

CSPP - PHASE 2

G-105

OXNARD AIRPORT

RUNWAY 7-25, TAXIWAY CONNECTORS, AND PARALLEL TAXIWAY PAVEMENT RECONSTRUCTION

SHEET 12 OF 243

DRAWING NO. 1240-DOA

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Attachment B - Safety Plan Compliance Document (SPCD)

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CONTRACTOR'S
SAFETY PLAN COMPLIANCE DOCUMENT (SPCD)
(AC 150/5370-2G)

Project Information

Airport and Sponsor: OXNARD AIRPORT, VENTURA COUNTY, CALIFORNIA

Project ID: FAA AIP NO. 3-06-0179-038-2021

Description of Project: Runway 7-25, Taxiway Connectors, and Parallel Taxiway Pavement Reconstruction

Type of Work: _____

FAA Project Manager: _____ Phone: _____

Airport Operator Contact: _____ Phone: _____

Contractor's Information

Prime Contractor: _____

Address: _____

Contractor Contact: _____ Phone: _____

Contractor's Responsibility

In accordance with Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5370-2G, *Operational Safety During Airport Construction,* a SPCD for a project must be submitted to the FAA and to the Airport Operator for review and approval prior to the issuance of a Notice-to-Proceed for Construction. The SPCD will be prepared in a detailed written and graphical format that identifies the timing and methodology for the Contractor's compliance with the project's Construction Safety and Phasing Plan (CSPP).

1.2.1 The Contractor will comply with all provisions contained herein and provide the following project-specific complementary and supplemental information to the FAA-approved Construction Safety and Phasing Plan:

1. Contractor will have copies of the CSPP and SPCD available at all times for reference by the Airport Operator and its representatives, and by Contractor's and subcontractor's employees.

   Location(s) of CSPP and SPCD: _____

   _____

2. Provide contact information for the person responsible for initiating and coordinating an immediate response to correct any construction-related activity that may adversely affect the operational safety of the Airport. Project will require 24-hour coverage.

   Point of Contact: _____ Phone: _____

3. Provide list of Contractor's on-site employees responsible for monitoring compliance with the CSPP and SPCD whenever active construction is ongoing.

   Contact Person: _____ Phone: _____
   Contact Person: _____ Phone: _____
   Contact Person: _____ Phone: _____
   Contact Person: _____ Phone: _____

4. Contractor will conduct inspections at least once daily, and more frequently if necessary to ensure construction personnel comply with the CSPP and SPCD and that there are no altered construction activities that could create potential safety hazards. A Construction Project Daily Safety Inspection Checklist is attached.

5. Describe details of Contractor's plan to restrict movement of construction vehicles and personnel to permitted construction areas by flagging, barricading, erecting temporary fencing, or providing escorts, as appropriate and as specified in the CSPP. Include the appropriate plan sheets to identify timing and/or location of control measures: [***Contractor to insert detailed description.]***

6. Describe details of Contractor's plan to ensure that no employees of Contractor, subcontractors, suppliers, or other persons enter any part of the Air Operations Area (AOA) unless authorized. [***Contractor to insert detailed description***.]

7. Provide a description and schedule of anticipated operation for all Contractor equipment over 15 feet in height (e.g. cranes, concrete pumps, other similarly tall equipment) and heights of stockpiles and haul routes when different from what is shown on previously filed CSPP. [***Contractor to insert detailed equipment list/stockpile heights as applicable.]***

   (As necessary, the Contractor must coordinate with the Airport Operator for the purpose of filing a supplemental submittal of FAA Form 7460-1 to the FAA for determination of whether or not an aeronautical study must be conducted prior to allowing tall equipment operations to begin.)

8. Provide a description of Contractor's plan to ensure that construction personnel are familiar with the safety procedures and regulations on the Airport, the CSPP, and the SPCD. [***Contractor to insert detailed description.]***

SPCD Amendment

The SPCD will be amended when there is a construction practice proposed by the Contractor that does not conform to the CSPP and SPCD and may impact the Airport's operational safety. This will require a revision to the CSPP and SPCD and re-coordination with the Airport Operator and the FAA in advance.

Statement of Certification

I certify that we understand the operational safety requirements of the CSPP and assert that we will not deviate from the approved CSPP and SPCD unless written approval is granted by the Airport Operator and FAA.

Print Name: _____ Title: _____

Signature: _____ Date: _____

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Attachment C - Definitions of Terms & Acronyms

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APPENDIX C. TERMS AND ACRONYMS

Table B-1. Terms and Acronyms

Term	Definition
Form 7460-1	Notice of Proposed Construction or Alteration. For on-airport projects, the form submitted to the FAA regional or airports division office as formal written notification of any kind of construction or alteration of objects that affect navigable airspace, as defined in 14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*. (See guidance available on the FAA web site at https://oeaaa.faa.gov.) The form may be downloaded at http://www.faa.gov/airports/resources/forms/, or filed electronically at: https://oeaaa.faa.gov.
Form 7480-1	Notice of Landing Area Proposal. Form submitted to the FAA Airports Regional Division Office or Airports District Office as formal written notification whenever a project without an airport layout plan on file with the FAA involves the construction of a new airport; the construction, realigning, altering, activating, or abandoning of a runway, landing strip, or associated taxiway; or the deactivation or abandoning of an entire airport The form may be downloaded at http://www.faa.gov/airports/resources/forms/.
Form 6000-26	Airport Sponsor Strategic Event Submission Form
AC	Advisory Circular
ACSI	Airport Certification Safety Inspector
ADG	Airplane Design Group
AIP	Airport Improvement Program
ALECP	Airport Lighting Equipment Certification Program
ANG	Air National Guard
AOA	Air Operations Area, as defined in 14 CFR Part 107. Means a portion of an airport, specified in the airport security program, in which security measures are carried out. This area includes aircraft movement areas, aircraft parking areas, loading ramps, and safety areas, and any adjacent areas (such as general aviation areas) that are not separated by adequate security systems, measures, or procedures. This area does not include the secured area of the airport terminal building.
ARFF	Aircraft Rescue and Fire Fighting
ARP	FAA Office of Airports
ASDA	Accelerate-Stop Distance Available
AT	Air Traffic
ATCT	Airport Traffic Control Tower
ATIS	Automatic Terminal Information Service
ATO	Air Traffic Organization
Certificated Airport	An airport that has been issued an Airport Operating Certificate by the FAA under

Term	Definition
	the authority of 14 CFR Part 139, *Certification of Airports*.
CFR	Code of Federal Regulations
Construction	The presence of construction-related personnel, equipment, and materials in any location that could infringe upon the movement of aircraft.
CSPP	Construction Safety and Phasing Plan. The overall plan for safety and phasing of a construction project developed by the airport operator, or developed by the airport operator's consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.
CTAF	Common Traffic Advisory Frequency
Displaced Threshold	A threshold that is located at a point on the runway other than the designated beginning of the runway. The portion of pavement behind a displaced threshold is available for takeoffs in either direction or landing from the opposite direction.
DOT	Department of Transportation
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FOD	Foreign Object Debris/Damage
FSS	Flight Service Station
GA	General Aviation
HAZMAT	Hazardous Materials
HMA	Hot Mix Asphalt
IAP	Instrument Approach Procedures
IFR	Instrument Flight Rules
ILS	Instrument Landing System
LDA	Landing Distance Available
LOC	Localizer antenna array
Movement Area	The runways, taxiways, and other areas of an airport that are used for taxiing or hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading aprons and aircraft parking areas (reference 14 CFR Part 139).
MSDS	Material Safety Data Sheet
MUTCD	Manual on Uniform Traffic Control Devices
NAVAID	Navigation Aid
NAVAID Critical Area	An area of defined shape and size associated with a NAVAID that must remain clear and graded to avoid interference with the electronic signal.
Non-Movement Area	The area inside the airport security fence exclusive of the Movement Area. It is important to note that the non-movement area includes pavement traversed by aircraft.

Term	Definition
NOTAM	Notices to Airmen
Obstruction	Any object/obstacle exceeding the obstruction standards specified by 14 CFR Part 77, subpart C.
OCC	Operations Control Center
OE / AAA	Obstruction Evaluation / Airport Airspace Analysis
OFA	Object Free Area. An area on the ground centered on the runway, taxiway, or taxi lane centerline provided to enhance safety of aircraft operations by having the area free of objects except for those objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes. (See AC 150/5300-13 for additional guidance on OFA standards and wingtip clearance criteria.)
OFZ	Obstacle Free Zone. The airspace below 150 ft (45 m) above the established airport elevation and along the runway and extended runway centerline that is required to be clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance protection for aircraft landing or taking off from the runway and for missed approaches. The OFZ is subdivided as follows: Runway OFZ, Inner Approach OFZ, Inner Transitional OFZ, and Precision OFZ. Refer to AC 150/5300-13 for guidance on OFZ.
OSHA	Occupational Safety and Health Administration
OTS	Out of Service
P&R	Planning and Requirements Group
NPI	NAS Planning & Integration
PAPI	Precision Approach Path Indicator
PFC	Passenger Facility Charge
PLASI	Pulse Light Approach Slope Indicator
Project Proposal Summary	A clear and concise description of the proposed project or change that is the object of Safety Risk Management.
RA	Reimbursable Agreement
RE	Resident Engineer
REIL	Runway End Identifier Lights
RNAV	Area Navigation
ROFA	Runway Object Free Area
RSA	Runway Safety Area. A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway, in accordance with AC 150/5300-13.
SDS	Safety Data Sheet
SIDA	Security Identification Display Area
SMS	Safety Management System

Term	Definition
SPCD	Safety Plan Compliance Document. Details developed and submitted by a contractor to the airport operator for approval providing details on how the performance of a construction project will comply with the CSPP.
SRM	Safety Risk Management
SSC	System Support Center
Taxiway Safety Area	A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway, in accordance with AC 150/5300-13.
TDG	Taxiway Design Group
Temporary	Any condition that is not intended to be permanent.
Temporary Runway End	The beginning of that portion of the runway available for landing and taking off in one direction, and for landing in the other direction. Note the difference from a displaced threshold.
Threshold	The beginning of that portion of the runway available for landing. In some instances, the landing threshold may be displaced.
TODA	Takeoff Distance Available
TOFA	Taxiway Object Free Area
TORA	Takeoff Run Available. The length of the runway less any length of runway unavailable and/or unsuitable for takeoff run computations. See AC 150/5300-13 for guidance on declared distances.
TSA	Taxiway Safety Area, or Transportation Security Administration
UNICOM	A radio communications system of a type used at small airports.
VASI	Visual Approach Slope Indicator
VGSI	Visual Glide Slope Indicator. A device that provides a visual glide slope indicator to landing pilots. These systems include precision approach path indicator (PAPI), visual approach slope indicator (VASI), and pulse light approach slope indicator (PLASI).
VFR	Visual Flight Rules
VOR	Very High Frequency Omnidirectional Radio Range
VPD	Vehicle / Pedestrian Deviation

Attachment D – Daily Safety Inspection Checklist

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APPENDIX D. CONSTRUCTION PROJECT DAILY SAFETY INSPECTION CHECKLIST

The situations identified below are potentially hazardous conditions that may occur during airport construction projects. Safety area encroachments, unauthorized and improper ground vehicle operations, and unmarked or uncovered holes and trenches near aircraft operating surfaces pose the most prevalent threats to airport operational safety during airport construction projects. The list below is one tool that the airport operator or contractor may use to aid in identifying and correcting potentially hazardous conditions. It should be customized as appropriate for each project including information such as the date, time and name of the person conducting the inspection.

Table D-1. Potentially Hazardous Conditions

Item	Action Required (Describe)	No Action Required (Check)
Excavation adjacent to runways, taxiways, and aprons improperly backfilled.		
Mounds of earth, construction materials, temporary structures, and other obstacles near any open runway, taxiway, or taxi lane; in the related Object Free area and aircraft approach or departure areas/zones; or obstructing any sign or marking.		
Runway resurfacing projects resulting in lips exceeding 3 inch (7.6 cm) from pavement edges and ends.		
Heavy equipment (stationary or mobile) operating or idle near AOA, in runway approaches and departures areas, or in OFZ.		
Equipment or material near NAVAIDs that may degrade or impair radiated signals and/or the monitoring of navigation and visual aids. Unauthorized or improper vehicle operations in localizer or glide slope critical areas, resulting in electronic interference and/or facility shutdown.		
Tall and especially relatively low visibility units (that is, equipment with slim profiles) — cranes, drills, and similar objects — located in critical areas, such as OFZ and		

Item	Action Required (Describe)	No Action Required (Check)
approach zones.		
Improperly positioned or malfunctioning lights or unlighted airport hazards, such as holes or excavations, on any apron, open taxiway, or open taxi lane or in a related safety, approach, or departure area.		
Obstacles, loose pavement, trash, and other debris on or near AOA. Construction debris (gravel, sand, mud, paving materials) on airport pavements may result in aircraft propeller, turbine engine, or tire damage. Also, loose materials may blow about, potentially causing personal injury or equipment damage.		
Inappropriate or poorly maintained fencing during construction intended to deter human and animal intrusions into the AOA. Fencing and other markings that are inadequate to separate construction areas from open AOA create aviation hazards.		
Improper or inadequate marking or lighting of runways (especially thresholds that have been displaced or runways that have been closed) and taxiways that could cause pilot confusion and provide a potential for a runway incursion. Inadequate or improper methods of marking, barricading, and lighting of temporarily closed portions of AOA create aviation hazards.		
Wildlife attractants — such as trash (food scraps not collected from construction personnel activity), grass seeds, tall grass, or standing water — on or near airports.		
Obliterated or faded temporary markings on active operational areas.		
Misleading or malfunctioning obstruction lights. Unlighted or unmarked obstructions in the approach to any open runway pose aviation hazards.		

Item	Action Required (Describe)	No Action Required (Check)
Failure to issue, update, or cancel NOTAMs about airport or runway closures or other construction related airport conditions.		
Failure to mark and identify utilities or power cables. Damage to utilities and power cables during construction activity can result in the loss of runway / taxiway lighting; loss of navigation, visual, or approach aids; disruption of weather reporting services; and/or loss of communications.		
Restrictions on ARFF access from fire stations to the runway / taxiway system or airport buildings.		
Lack of radio communications with construction vehicles in airport movement areas.		
Objects, regardless of whether they are marked or flagged, or activities anywhere on or near an airport that could be distracting, confusing, or alarming to pilots during aircraft operations.		
Water, snow, dirt, debris, or other contaminants that temporarily obscure or derogate the visibility of runway/taxiway marking, lighting, and pavement edges. Any condition or factor that obscures or diminishes the visibility of areas under construction.		
Spillage from vehicles (gasoline, diesel fuel, oil) on active pavement areas, such as runways, taxiways, aprons, and airport roadways.		
Failure to maintain drainage system integrity during construction (for example, no temporary drainage provided when working on a drainage system).		

Item	Action Required (Describe)	No Action Required (Check)
Failure to provide for proper electrical lockout and tagging procedures. At larger airports with multiple maintenance shifts/workers, construction contractors should make provisions for coordinating work on circuits.		
Failure to control dust. Consider limiting the amount of area from which the contractor is allowed to strip turf.		
Exposed wiring that creates an electrocution or fire ignition hazard. Identify and secure wiring, and place it in conduit or bury it.		
Site burning, which can cause possible obscuration.		
Construction work taking place outside of designated work areas and out of phase.		

Attachment E – Example Construction Schedules

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Attachment E1 – Example Schedule for Base Bid

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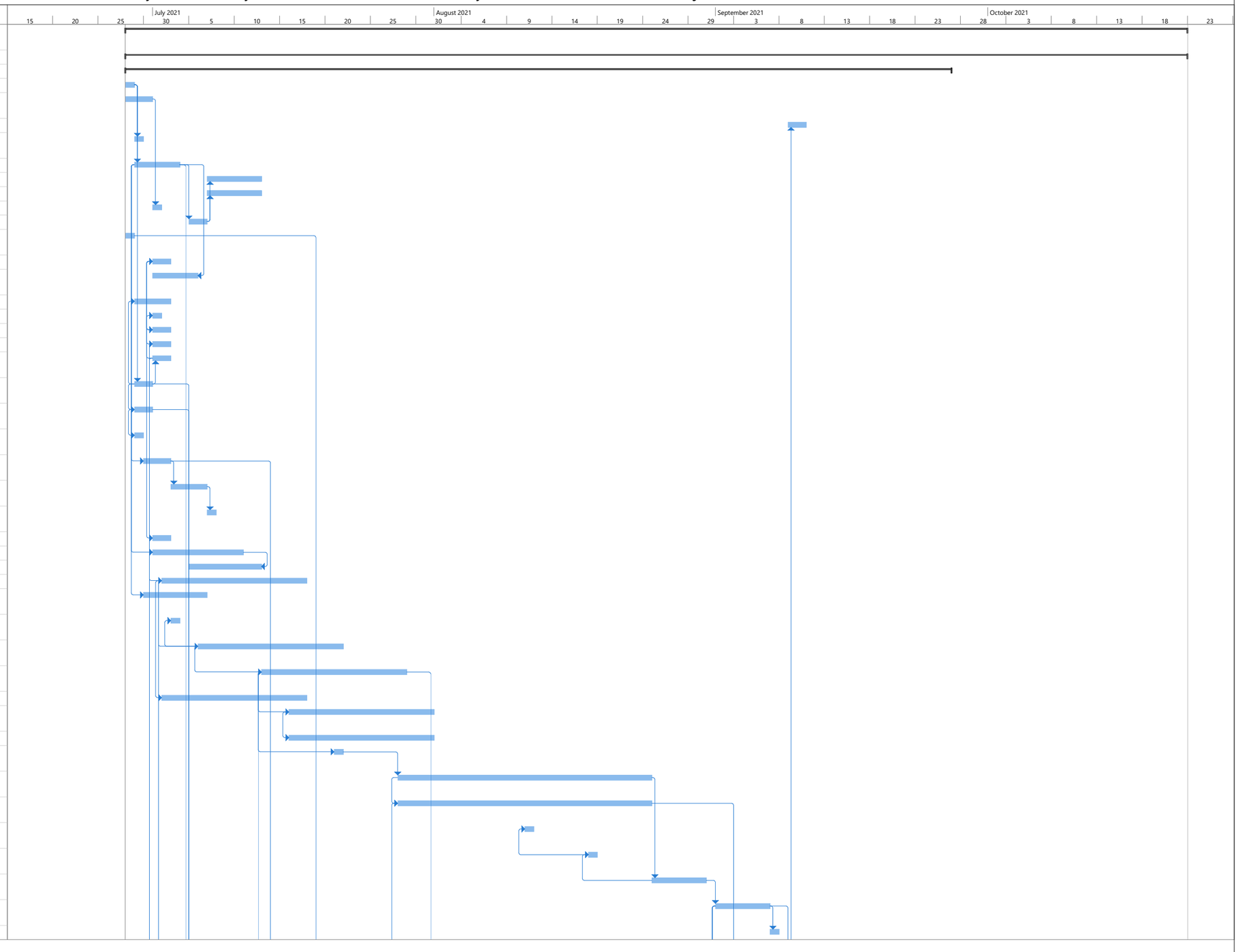
Runway 7-25, Taxiway Connectors, and Parallel Taxiway Pavement Reconstruction Project

Mon 3/29/21

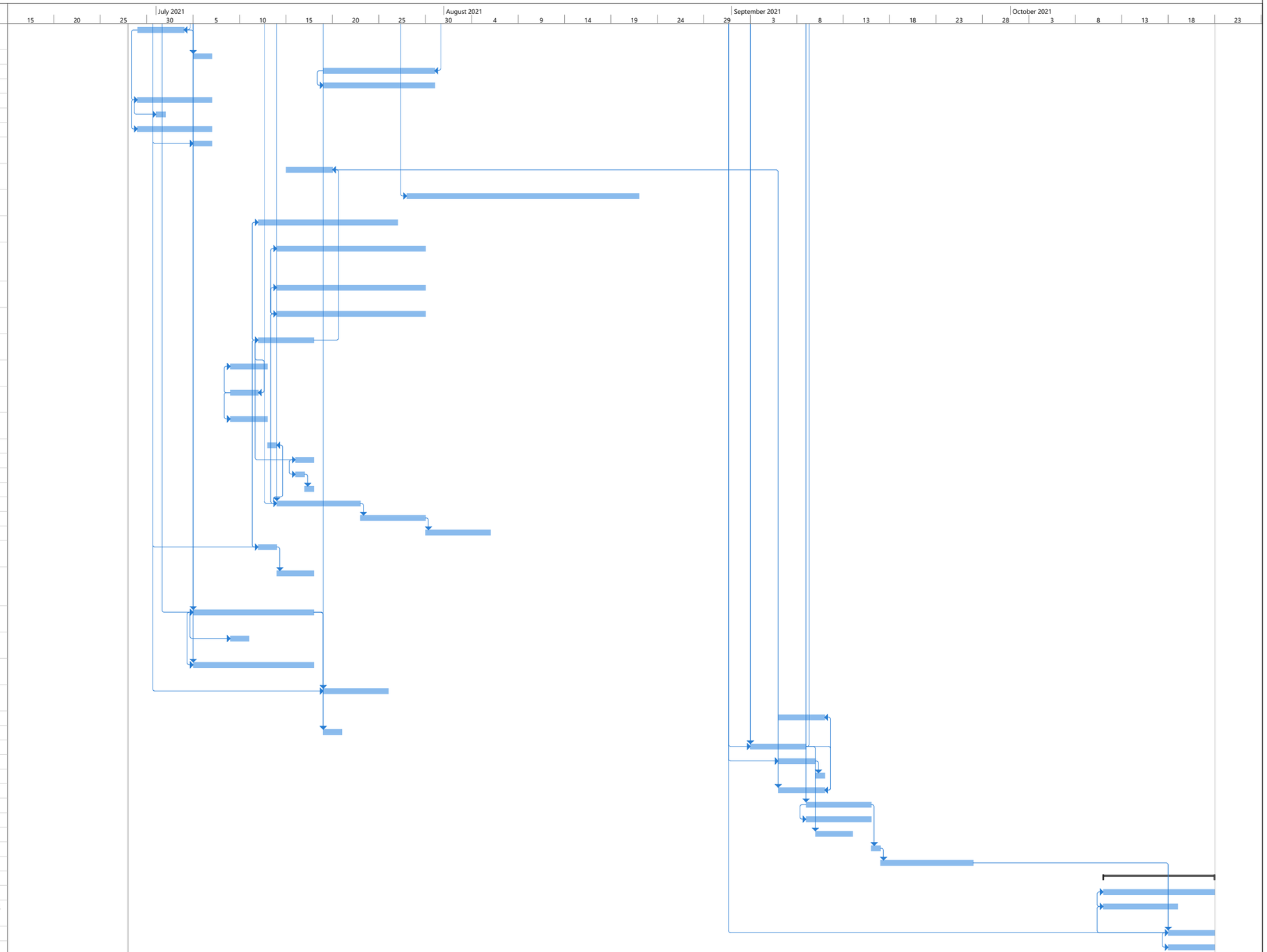
ID	Task Name	Duration	Start	Finish
1	**Runway 7-25, Taxiway Connectors, and Parallel Taxiway Pavement Reconstruction (Base Bid)**	**117 days**	**Mon 6/28/21**	**Fri 10/22/21**
2	**Construction Element**	**117 days**	**Mon 6/28/21**	**Fri 10/22/21**
3	**Phase 1**	**91 days**	**Mon 6/28/21**	**Sun 9/26/21**
4	Airfield Safety and Traffic Control	1 day	Mon 6/28/21	Mon 6/28/21
5	Compliance with Pollution, Erosion, and Siltation Control	3 days	Mon 6/28/21	Wed 6/30/21
6	Airport Access and Haul Route Repair	2 days	Thu 9/9/21	Fri 9/10/21
7	Underground Utility Investigation and Potholing	1 day	Tue 6/29/21	Tue 6/29/21
8	Demolish Asphalt Pavement	5 days	Tue 6/29/21	Sat 7/3/21
9	Asphalt Crack Repair (under 1.5" width)	6 days	Wed 7/7/21	Mon 7/12/21
10	Asphalt Crack Repair (over 1.5" width)	6 days	Wed 7/7/21	Mon 7/12/21
11	Remove Pavement Markings	1 day	Thu 7/1/21	Thu 7/1/21
12	Cold Mill, Variable Depth (2 inches Maximum)	2 days	Mon 7/5/21	Tue 7/6/21
13	Remove and Salvage REILs. Demolish PCC Foundation	1 day	Mon 6/28/21	Mon 6/28/21
14	Demolish Conduit, Cable, and Counterpoise	2 days	Thu 7/1/21	Fri 7/2/21
15	Demolish Concrete Encased Conduit, Cable, and Counterpoise	5 days	Thu 7/1/21	Mon 7/5/21
16	Remove Cable and Counterpoise	4 days	Tue 6/29/21	Fri 7/2/21
17	Demolish Electrical Junction Can	1 day	Thu 7/1/21	Thu 7/1/21
18	Demolish Electrical Pullboxes	2 days	Thu 7/1/21	Fri 7/2/21
19	Demolish Airfield Sign and Pad	2 days	Thu 7/1/21	Fri 7/2/21
20	Remove and Salvage Elevated Taxiway Edge Light Fixture and Transformer. Protect Can.	2 days	Thu 7/1/21	Fri 7/2/21
21	Remove and Salvage Elevated Runway Edge Light Fixture and Transformer. Protect Can	2 days	Tue 6/29/21	Wed 6/30/21
22	Remove and Salvage Elevated Threshold Light Fixture and Transformer. Protect Can	2 days	Tue 6/29/21	Wed 6/30/21
23	Remove and Salvage In-pavement Runway Edge Light Fixture and Transformer. Protect Can.	1 day	Tue 6/29/21	Tue 6/29/21
24	Demolish MALSF Threshold Bar (13 Lights). Salvage Existing Fixtures	3 days	Wed 6/30/21	Fri 7/2/21
25	Demolish 3 MALSF Centerline Bars (5 Lights Each). Salvage Existing Fixtures	4 days	Sat 7/3/21	Tue 7/6/21
26	Demolish Reinforced Foundation from Abandoned MALSF Bar	1 day	Wed 7/7/21	Wed 7/7/21
27	Demolish Abandoned Waterline, if Encountered	2 days	Thu 7/1/21	Fri 7/2/21
28	Unclassified Excavation and Haul-Off	10 days	Thu 7/1/21	Sat 7/10/21
29	Embankment in Place	8 days	Mon 7/5/21	Mon 7/12/21
30	Subgrade Preparation	16 days	Fri 7/2/21	Sat 7/17/21
31	Place Asphalt Compacted Grindings, 24-inches thick	7 days	Wed 6/30/21	Tue 7/6/21
32	Lime Treated Subgrade, 16-inch Depth (Control Strip)	1 day	Sat 7/3/21	Sat 7/3/21
33	Lime Treated Subgrade, 16-inch Depth (1st Mix)	16 days	Tue 7/6/21	Wed 7/21/21
34	Lime Treated Subgrade, 16-inch Depth (2nd Mix and Compact)	16 days	Tue 7/13/21	Wed 7/28/21
35	In-Place Drying Techniques	16 days	Fri 7/2/21	Sat 7/17/21
36	Subgrade Stabilization, Excavation Below Subgrade	16 days	Fri 7/16/21	Sat 7/31/21
37	Multi-Axial Geogrid	16 days	Fri 7/16/21	Sat 7/31/21
38	Crushed Aggregate Base Course, P-209 (Control Strip)	1 day	Wed 7/21/21	Wed 7/21/21
39	Crushed Aggregate Base Course, P-209 (Pavement Section)	28 days	Wed 7/28/21	Tue 8/24/21
40	Crushed Aggregate Base Course, P-209 (Shoulders)	28 days	Wed 7/28/21	Tue 8/24/21
41	Asphalt Concrete Surface Course, P-401 (Control Strip #1)	1 day	Wed 8/11/21	Wed 8/11/21
42	Asphalt Concrete Surface Course, P-401 (Control Strip #2)	1 day	Wed 8/18/21	Wed 8/18/21
43	Asphalt Concrete Surface Course, P-401 (First Lift)	6 days	Wed 8/25/21	Mon 8/30/21
44	Asphalt Concrete Surface Course, P-401 (Second Lift)	6 days	Wed 9/1/21	Mon 9/6/21
45	Install 2 Runway Threshold Monuments	1 day	Tue 9/7/21	Tue 9/7/21



Project: Complete Project Sched
Date: Mon 3/29/21

Task · Split · Milestone · Summary · Project Summary · Inactive Task · Inactive Milestone · Inactive Summary · Manual Task · Duration-only · Manual Summary Rollup · Manual Summary · Start-only · Finish-only · External Tasks · External Milestone · Deadline · Progress · Manual Progress

ID	Task Name	Duration	Start	Finish
46	12-inch RCP, Class IV, outside Pavement Areas	5 days	Tue 6/29/21	Sat 7/3/21
47	12-inch RCP, Class IV, within Pavement Areas	2 days	Mon 7/5/21	Tue 7/6/21
48	Underdrain Pipe, 6-inch, Perforated	12 days	Mon 7/19/21	Fri 7/30/21
49	Underdrain Pipe Cleanouts	12 days	Mon 7/19/21	Fri 7/30/21
50	48" Stormdrain Manholes	8 days	Tue 6/29/21	Tue 7/6/21
51	Adjust Catch Basin to Grade	1 day	Thu 7/1/21	Thu 7/1/21
52	Connect to Existing Manholes/Basins	8 days	Tue 6/29/21	Tue 7/6/21
53	Controlled Low-Strength Material (CLSM) for Existing Utility Protection	2 days	Mon 7/5/21	Tue 7/6/21
54	No. 8 AWG 5 kV, L-824, Type C Cable, Installed in Duct Bank or Conduit	5 days	Thu 7/15/21	Mon 7/19/21
55	No. 6 AWG Tinned Counterpoise Wire, Installed Adjacent to Duct Bank or Conduit	25 days	Wed 7/28/21	Sat 8/21/21
56	No. 6 AWG Tinned Counterpoise Wire, Installed in Duct Bank or Conduit	15 days	Mon 7/12/21	Mon 7/26/21
57	No. 1/0 AWG Tinned Counterpoise Wire for MALSF, Installed Adjacent to / In the Duct Bank or Conduit	16 days	Wed 7/14/21	Thu 7/29/21
58	No. 2-8 AWG 600V, L-824, Type THWN-2 Cable for MALSF, Installed in Duct Bank or Conduit	16 days	Wed 7/14/21	Thu 7/29/21
59	Concrete Encased Electrical Duct Bank, 1W - 2" GRMC Conduit	16 days	Wed 7/14/21	Thu 7/29/21
60	Non-encased Electrical Duct Bank, 1W - 2" Conduit	6 days	Mon 7/12/21	Sat 7/17/21
61	Non-encased Electrical Duct Bank, 1W - 3" and 1W - 2" Conduit	4 days	Fri 7/9/21	Mon 7/12/21
62	Non-encased Electrical Duct Bank, 1W - 3" and 2W - 2" Conduit	3 days	Fri 7/9/21	Mon 7/12/21
63	Non-encased Electrical Duct Bank, 1W - 3" and 3W - 2" Conduit	4 days	Fri 7/9/21	Mon 7/12/21
64	Construct FAA Pull Box	1 day	Tue 7/13/21	Wed 7/14/21
65	Construct 24" Junction Can: L-868 with Lid	2 days	Fri 7/16/21	Sat 7/17/21
66	Adjust Junction Can to Grade	1 day	Fri 7/16/21	Fri 7/16/21
67	Adjust Electrical Pullbox to Grade	1 day	Sat 7/17/21	Sat 7/17/21
68	Construct MALSF Threshold Bar	9 days	Wed 7/14/21	Thu 7/22/21
69	Construct 3 MALSF Centerline Bars	7 days	Fri 7/23/21	Thu 7/29/21
70	MALSF PCC Cure Time	7 edays	Thu 7/29/21	Thu 8/5/21
71	Construct New L-858B(L) Distance Remaining Sign and Concrete Pad	2 days	Mon 7/12/21	Tue 7/13/21
72	Construct New L-858(L) Taxiway Guidance Sign without Taxiway Identifier and Concrete Pad	4 days	Wed 7/14/21	Sat 7/17/21
73	Adjust Base Can for New L-861(L) Elevated Runway Edge Light	13 days	Mon 7/5/21	Sat 7/17/21
74	Adjust Base Can for New L-852D(L) In-Pavement Runway Edge Light	2 days	Fri 7/9/21	Sat 7/10/21
75	Adjust Base Can for New L-861E(L) Runway Threshold Light and Transformer	13 days	Mon 7/5/21	Sat 7/17/21
76	Adjust Base Can for Salvaged Elevated Taxiway Edge Light and Transformer	7 days	Mon 7/19/21	Sun 7/25/21
77	Install ID Tag	5 days	Mon 9/6/21	Fri 9/10/21
78	Install Salvaged REILs on New Concrete Pad	2 days	Mon 7/19/21	Tue 7/20/21
79	Shoulder Finishing and Miscellanous Grading	6 days	Fri 9/3/21	Wed 9/8/21
80	Install MALSF Light Fixtures	4 days	Mon 9/6/21	Thu 9/9/21
81	FAA MALSF Inspections	1 day	Fri 9/10/21	Fri 9/10/21
82	Install Runway and Taxiway Light Fixtures	5 days	Mon 9/6/21	Fri 9/10/21
83	Marking, 2 Coats with Beads (First Coat)	7 days	Thu 9/9/21	Wed 9/15/21
84	Marking, 2 Coats with No Beads (First Coat)	7 days	Thu 9/9/21	Wed 9/15/21
85	Hydroseeding	4 days	Fri 9/10/21	Mon 9/13/21
86	Flight Check	1 day	Thu 9/16/21	Thu 9/16/21
87	Float	10 days	Fri 9/17/21	Sun 9/26/21
88	**Phase 2 (Night Closures)**	**12 days**	**Mon 10/11/21**	**Fri 10/22/21**
89	Airfield Safety and Traffic Control	12 days	Mon 10/11/21	Fri 10/22/21
90	Grooving (30 Days after P-401 paving is completed)	8 days	Mon 10/11/21	Mon 10/18/21
91	Marking, 2 Coats with Beads (Second Coat)	5 days	Mon 10/18/21	Fri 10/22/21
92	Marking, Single Coat with No Beads (Second Coat)	5 days	Mon 10/18/21	Fri 10/22/21



Attachment E2 – Example Schedule for Base Bid + Bid Alternate 1

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Runway 7-25, Taxiway Connectors, and Parallel Taxiway Pavement Reconstruction Project

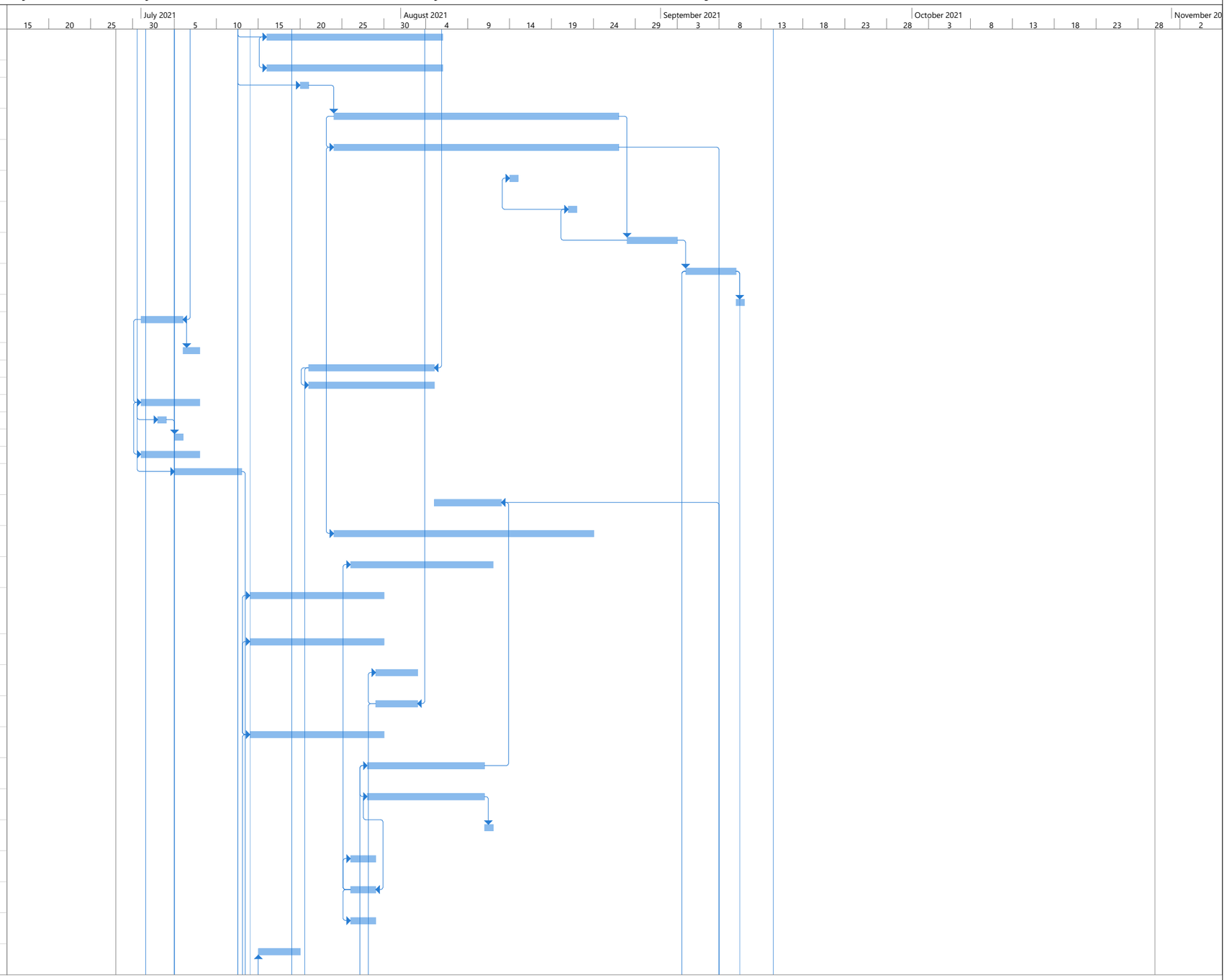
Mon 3/29/21

ID	Task Name	Duration	Start	Finish
1	**Runway 7-25, Taxiway Connectors, and Parallel Taxiway Pavement Reconstruction (Base Bid + Bid Alt 1)**	**124 days**	**Mon 6/28/21**	**Fri 10/29/21**
2	**Construction Element**	**124 days**	**Mon 6/28/21**	**Fri 10/29/21**
3	**Phase 1**	**98 days**	**Mon 6/28/21**	**Sun 10/3/21**
4	Airfield Safety and Traffic Control	1 day	Mon 6/28/21	Mon 6/28/21
5	Compliance with Pollution, Erosion, and Siltation Control	3 days	Mon 6/28/21	Wed 6/30/21
6	Airport Access and Haul Route Repair	2 days	Tue 9/14/21	Wed 9/15/21
7	Underground Utility Investigation and Potholing	2 days	Tue 6/29/21	Wed 6/30/21
8	Demolish Asphalt Pavement	7 days	Tue 6/29/21	Mon 7/5/21
9	Asphalt Crack Repair (under 1.5" width)	2 days	Wed 7/7/21	Thu 7/8/21
10	Asphalt Crack Repair (over 1.5" width)	4 days	Wed 7/7/21	Sat 7/10/21
11	Remove Airfield Marking	2 days	Thu 7/1/21	Fri 7/2/21
12	Cold Mill, Variable Depth (2 inches Maximum)	1 day	Tue 7/6/21	Tue 7/6/21
13	Remove and Salvage REILs. Demolish PCC Foundation	1 day	Thu 7/1/21	Thu 7/1/21
14	Demolish Conduit, Cable, and Counterpoise	16 days	Fri 7/2/21	Sat 7/17/21
15	Demolish Concrete Encased Conduit, Cable, and Counterpoise	5 days	Fri 7/2/21	Tue 7/6/21
16	Remove Cable and Counterpoise	3 days	Tue 6/29/21	Thu 7/1/21
17	Remove and Salvage Unlit Information Sign	1 day	Sat 7/17/21	Sat 7/17/21
18	Remove and Salvage Unlit Information Sign. Demolish Concrete Pad	1 day	Sat 7/17/21	Sat 7/17/21
19	Demolish Electrical Junction Can	1 day	Fri 7/2/21	Fri 7/2/21
20	Demolish Electrical Pullboxes	16 days	Fri 7/2/21	Sat 7/17/21
21	Demolish Airfield Sign and Pad	16 days	Fri 7/2/21	Sat 7/17/21
22	Remove and Salvage Elevated Runway Edge Light Fixture and Transformer. Protect Can	2 days	Tue 6/29/21	Wed 6/30/21
23	Remove and Salvage Elevated Threshold Light Fixture and Transformer. Protect Can	2 days	Tue 6/29/21	Wed 6/30/21
24	Demolish Elevated Taxiway Edge Light and Can. Salvage Existing Fixture	16 days	Fri 7/2/21	Sat 7/17/21
25	Demolish Elevated Runway Edge Light and Can. Salvage Existing Fixture.	1 day	Thu 7/1/21	Thu 7/1/21
26	Demolish In-pavement Taxiway Edge Light and Can. Salvage Existing Fixture.	2 days	Fri 7/2/21	Sat 7/3/21
27	Demolish In-pavement Runway Edge Light and Can. Salvage Existing Fixture.	1 day	Mon 7/5/21	Mon 7/5/21
28	Demolish MALSF Threshold Bar (13 Lights). Salvage Existing Fixtures	3 days	Wed 6/30/21	Fri 7/2/21
29	Demolish 3 MALSF Centerline Bars (5 Lights Each). Salvage Existing Fixtures	4 days	Sat 7/3/21	Tue 7/6/21
30	Demolish Reinforced Foundation from Abandoned MALSF Bar	1 day	Wed 7/7/21	Wed 7/7/21
31	Demolish Abandoned Waterline, if Encountered	7 days	Fri 7/2/21	Thu 7/8/21
32	Unclassified Excavation and Haul-Off	14 days	Thu 7/1/21	Wed 7/14/21
33	Embankment in Place	10 days	Wed 7/7/21	Fri 7/16/21
34	Subgrade Preparation	19 days	Fri 7/2/21	Tue 7/20/21
35	Place Asphalt Compacted Grindings, 24-inches thick	7 days	Wed 6/30/21	Tue 7/6/21
36	Lime Treated Subgrade, 16-inch Depth (Control Strip)	1 day	Sat 7/3/21	Sat 7/3/21
37	Lime Treated Subgrade, 16-inch Depth (1st Mix)	21 days	Tue 7/6/21	Mon 7/26/21
38	Lime Treated Subgrade, 16-inch Depth (2nd Mix and Compact)	21 days	Tue 7/13/21	Mon 8/2/21
39	In-Place Drying Techniques	19 days	Fri 7/2/21	Tue 7/20/21

Project: Complete Project Sched
Date: Mon 3/29/21

Task | Summary | Inactive Milestone | Duration-only | Start-only | External Milestone | Manual Progress
Split | Project Summary | Inactive Summary | Manual Summary Rollup | Finish-only | Deadline
Milestone | Inactive Task | Manual Task | Manual Summary | External Tasks | Progress

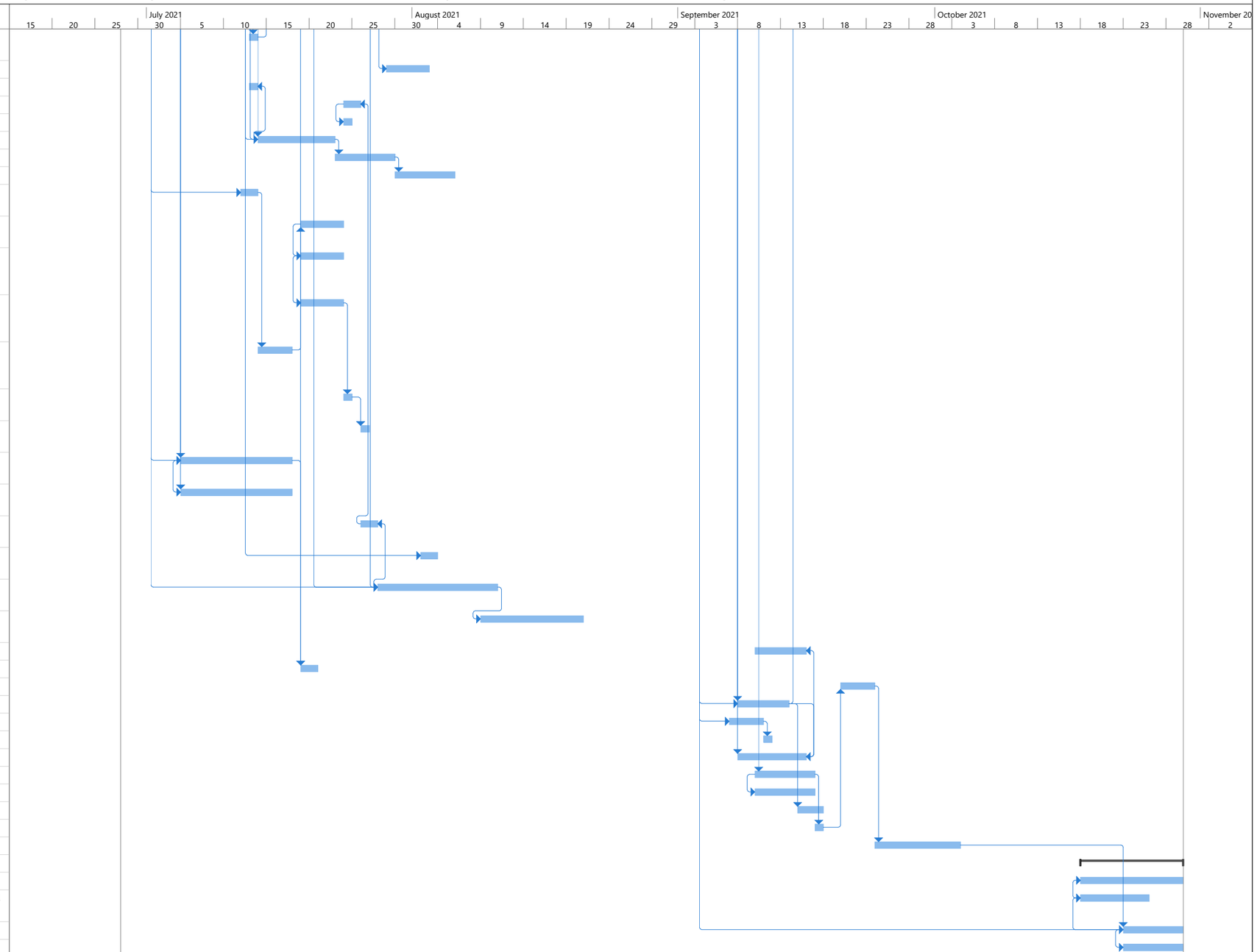
ID	Task Name	Duration	Start	Finish
40	Subgrade Stabilization, Excavation Below Subgrade	21 days	Fri 7/16/21	Thu 8/5/21
41	Multi-Axial Geogrid	21 days	Fri 7/16/21	Thu 8/5/21
42	Crushed Aggregate Base Course, P-209 (Control Strip)	1 day	Tue 7/20/21	Tue 7/20/21
43	Crushed Aggregate Base Course, P-209 (Pavement Section)	34 days	Sat 7/24/21	Thu 8/26/21
44	Crushed Aggregate Base Course, P-209 (Shoulders)	34 days	Sat 7/24/21	Thu 8/26/21
45	Asphalt Concrete Surface Course, P-401 (Control Strip #1)	1 day	Sat 8/14/21	Sat 8/14/21
46	Asphalt Concrete Surface Course, P-401 (Control Strip #2)	1 day	Sat 8/21/21	Sat 8/21/21
47	Asphalt Concrete Surface Course, P-401 (First Lift)	6 days	Sat 8/28/21	Thu 9/2/21
48	Asphalt Concrete Surface Course, P-401 (Second Lift)	6 days	Sat 9/4/21	Thu 9/9/21
49	Install 2 Runway Threshold Monuments	1 day	Fri 9/10/21	Fri 9/10/21
50	12-inch RCP, Class IV, outside Pavement Areas	5 days	Thu 7/1/21	Mon 7/5/21
51	12-inch RCP, Class IV, within Pavement Areas	2 days	Tue 7/6/21	Wed 7/7/21
52	Underdrain Pipe, 6-inch, Perforated	15 days	Wed 7/21/21	Wed 8/4/21
53	Underdrain Pipe Cleanouts	15 days	Wed 7/21/21	Wed 8/4/21
54	48" Stormdrain Manholes	7 days	Thu 7/1/21	Wed 7/7/21
55	Catch Basin/Drop Inlet	1 day	Sat 7/3/21	Sat 7/3/21
56	Adjust Catch Basin to Grade	1 day	Mon 7/5/21	Mon 7/5/21
57	Connect to Existing Manholes/Basins	7 days	Thu 7/1/21	Wed 7/7/21
58	Controlled Low-Strength Material (CLSM) for Existing Utility Protection	8 days	Mon 7/5/21	Mon 7/12/21
59	No. 8 AWG 5 kV, L-824, Type C Cable, Installed in Duct Bank or Conduit	8 days	Thu 8/5/21	Thu 8/12/21
60	No. 6 AWG Tinned Counterpoise Wire, Installed Adjacent to Duct Bank or Conduit	31 days	Sat 7/24/21	Mon 8/23/21
61	No. 6 AWG Tinned Counterpoise Wire, Installed in Duct Bank or Conduit	17 days	Mon 7/26/21	Wed 8/11/21
62	No. 1/0 AWG Tinned Counterpoise Wire for MALSF, Installed Adjacent to / In the Duct Bank or Conduit	16 days	Wed 7/14/21	Thu 7/29/21
63	No. 2-8 AWG 600V, L-824, Type THWN-2 Cable for MALSF, Installed in Duct Bank or Conduit	16 days	Wed 7/14/21	Thu 7/29/21
64	Concrete Encased Electrical Duct Bank, 1W - 2" Conduit	5 days	Thu 7/29/21	Mon 8/2/21
65	Concrete Encased Electrical Duct Bank, 3W - 2" Conduit	5 days	Thu 7/29/21	Mon 8/2/21
66	Concrete Encased Electrical Duct Bank, 1W - 2" GRMC Conduit	16 days	Wed 7/14/21	Thu 7/29/21
67	Non-encased Electrical Duct Bank, 1W - 2" Conduit	14 days	Wed 7/28/21	Tue 8/10/21
68	Non-encased Electrical Duct Bank, 2W - 2" Conduit	14 days	Wed 7/28/21	Tue 8/10/21
69	Non-encased Electrical Duct Bank, 3W - 2" Conduit	1 day	Wed 8/11/21	Wed 8/11/21
70	Non-encased Electrical Duct Bank, 1W - 3" and 1W - 2" Conduit	3 days	Mon 7/26/21	Wed 7/28/21
71	Non-encased Electrical Duct Bank, 1W - 3" and 2W - 2" Conduit	3 days	Mon 7/26/21	Wed 7/28/21
72	Non-encased Electrical Duct Bank, 1W - 3" and 3W - 2" Conduit	3 days	Mon 7/26/21	Wed 7/28/21
73	Concrete Encase Existing FAA Line Under Proposed Pavement	5 days	Thu 7/15/21	Mon 7/19/21



Project: Complete Project Sched
Date: Mon 3/29/21

Task | Split | Milestone | Summary | Project Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Deadline | Progress | Manual Progress

ID	Task Name	Duration	Start	Finish
74	Concrete Encase Existing FAA Line Outside Pavement	1 day	Tue 7/13/21	Tue 7/13/21
75	Construct Electrical Pullbox: Aircraft Rated	5 days	Thu 7/29/21	Mon 8/2/21
76	Construct FAA Pull Box	1 day	Tue 7/13/21	Wed 7/14/21
77	Construct 24" Junction Can: L-868 with Lid	2 days	Sat 7/24/21	Mon 7/26/21
78	Adjust Junction Can to Grade	1 day	Sat 7/24/21	Sat 7/24/21
79	Construct MALSF Threshold Bar	9 days	Wed 7/14/21	Thu 7/22/21
80	Construct 3 MALSF Centerline Bars	7 days	Fri 7/23/21	Thu 7/29/21
81	MALSF PCC Cure Time	7 edays	Thu 7/29/21	Thu 8/5/21
82	Construct New L-858B(L) Distance Remaining Sign and Concrete Pad	2 days	Mon 7/12/21	Tue 7/13/21
83	Construct New L-858(L) Runway Hold Position Sign and Concrete Pad	5 days	Mon 7/19/21	Fri 7/23/21
84	Construct New L-858(L) Taxiway Guidance Sign, Double Arrow, with Taxiway Identifier and Concrete Pad	5 days	Mon 7/19/21	Fri 7/23/21
85	Construct New L-858(L) Taxiway Guidance Sign, Single Arrow, with Taxiway Identifier and Concrete Pad	5 days	Mon 7/19/21	Fri 7/23/21
86	Construct New L-858(L) Taxiway Guidance Sign without Taxiway Identifier and Concrete Pad	4 days	Wed 7/14/21	Sat 7/17/21
87	Install Salvaged Unlit Informational Sign on Existing Concrete Pad	1 day	Sat 7/24/21	Sat 7/24/21
88	Install Salvaged Unlit Informational Sign on New Concrete Pad	1 day	Mon 7/26/21	Mon 7/26/21
89	Adjust Base Can for New L-861(L) Elevated Runway Edge Light	13 days	Mon 7/5/21	Sat 7/17/21
90	Adjust Base Can for New L-861E(L) Runway Threshold Light and Transformer	13 days	Mon 7/5/21	Sat 7/17/21
91	Construct New L-861(L) Elevated Runway Edge Light and Base Can	2 days	Mon 7/26/21	Wed 7/28/21
92	Construct New L-852D(L) In-Pavement Runway Edge Light and Base Can	2 days	Mon 8/2/21	Tue 8/3/21
93	Construct New L-861T(L) Medium Intensity Elevated Taxiway Edge Light and Base Can	14 days	Wed 7/28/21	Tue 8/10/21
94	Construct New L-852T(L) Medium Intensity In-Pavement Taxiway Edge Light and Base Can	12 days	Mon 8/9/21	Fri 8/20/21
95	Install ID Tag	6 days	Fri 9/10/21	Wed 9/15/21
96	Install Salvaged REILs on New Concrete Pad	2 days	Mon 7/19/21	Tue 7/20/21
97	Change Sign Legend	4 days	Mon 9/20/21	Thu 9/23/21
98	Shoulder Finishing and Miscellanous Grading	6 days	Wed 9/8/21	Mon 9/13/21
99	Install MALSF Light Fixtures	4 days	Tue 9/7/21	Fri 9/10/21
100	FAA MALSF Inspections	1 day	Sat 9/11/21	Sat 9/11/21
101	Install Runway and Taxiway Light Fixtures	8 days	Wed 9/8/21	Wed 9/15/21
102	Marking, 2 Coats with Beads (First Coat)	7 days	Fri 9/10/21	Thu 9/16/21
103	Marking, 2 Coats with No Beads (First Coat)	7 days	Fri 9/10/21	Thu 9/16/21
104	Hydroseeding	3 days	Wed 9/15/21	Fri 9/17/21
105	Flight Check	1 day	Fri 9/17/21	Fri 9/17/21
106	Float	10 days	Fri 9/24/21	Sun 10/3/21
107	**Phase 2 (Night Closures)**	**12 days**	**Mon 10/18/21**	**Fri 10/29/21**
108	Airfield Safety and Traffic Control	12 days	Mon 10/18/21	Fri 10/29/21
109	Grooving (30 Days after P-401 paving is completed)	8 days	Mon 10/18/21	Mon 10/25/21
110	Marking, 2 Coats with Beads (Second Coat)	7 days	Sat 10/23/21	Fri 10/29/21
111	Marking, Single Coat with No Beads (Second Coat)	7 days	Sat 10/23/21	Fri 10/29/21



Project: Complete Project Sched
Date: Mon 3/29/21

Task | Split | Milestone | Summary | Project Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Deadline | Progress | Manual Progress

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Attachment E3 – Example Schedule for Base Bid + Bid Alternates 1 and 2

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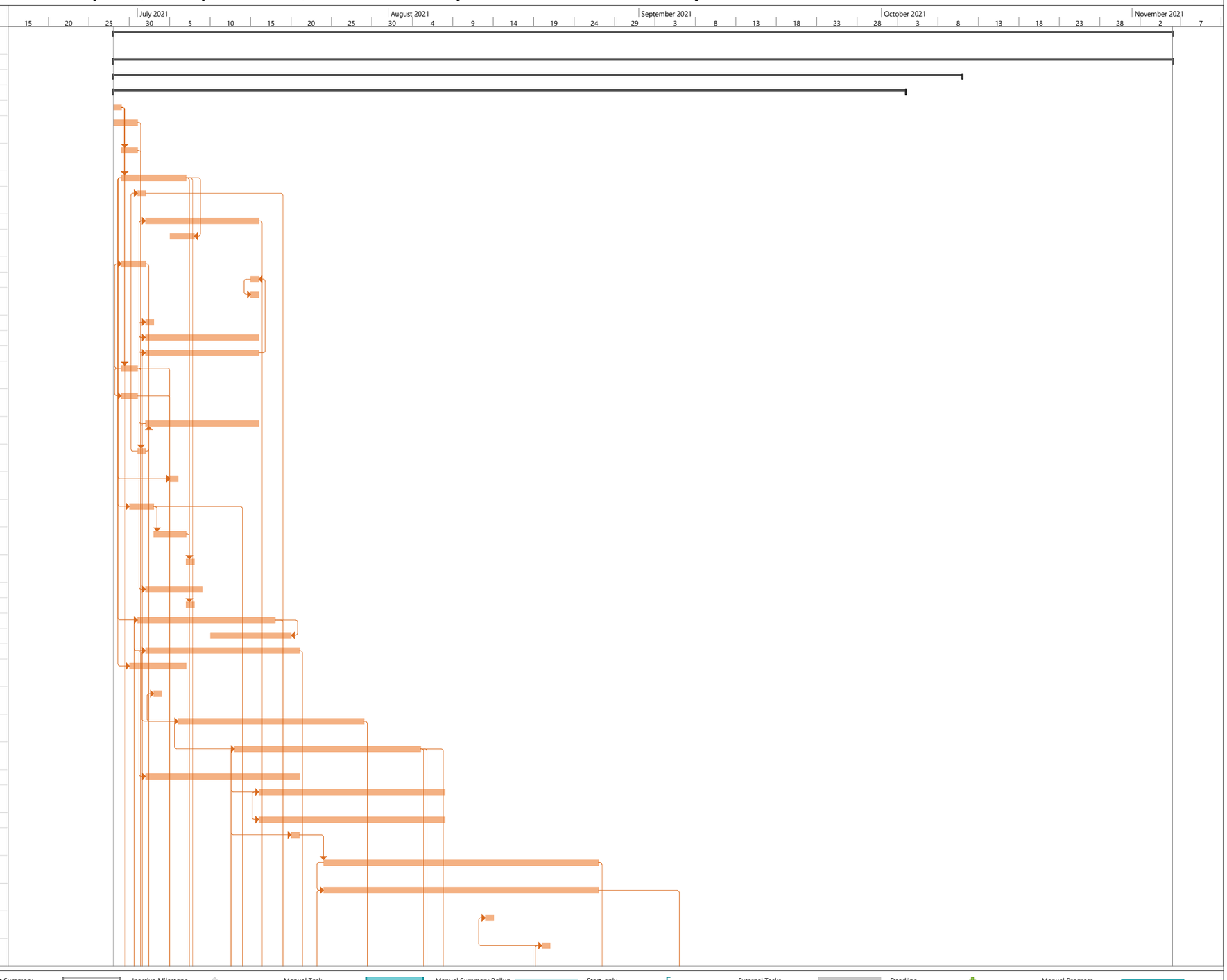
Runway 7-25, Taxiway Connectors, and Parallel Taxiway Pavement Reconstruction Project

Mon 3/29/21

ID	Task Name	Duration	Start	Finish
1	**Runway 7-25, Taxiway Connectors, and Parallel Taxiway Pavement Reconstruction (Base Bid + Bid Alts 1 & 2)**	**131 days**	**Mon 6/28/21**	**Fri 11/5/21**
2	**Construction Element**	**131 days**	**Mon 6/28/21**	**Fri 11/5/21**
3	**Phase 1**	**105 days**	**Mon 6/28/21**	**Sun 10/10/21**
4	**Work Area 1**	**98 days**	**Mon 6/28/21**	**Sun 10/3/21**
5	Airfield Safety and Traffic Control	1 day	Mon 6/28/21	Mon 6/28/21
6	Compliance with Pollution, Erosion, and Siltation Control	3 days	Mon 6/28/21	Wed 6/30/21
7	Underground Utility Investigation and Potholing	2 days	Tue 6/29/21	Wed 6/30/21
8	Demolish Asphalt Pavement	8 days	Tue 6/29/21	Tue 7/6/21
9	Remove and Salvage REILs. Demolish PCC Foundation	1 day	Thu 7/1/21	Thu 7/1/21
10	Demolish Conduit, Cable, and Counterpoise	14 days	Fri 7/2/21	Thu 7/15/21
11	Demolish Concrete Encased Conduit, Cable, and Counterpoise	3 days	Mon 7/5/21	Wed 7/7/21
12	Remove Cable and Counterpoise	3 days	Tue 6/29/21	Thu 7/1/21
13	Remove and Salvage Unlit Information Sign	1 day	Thu 7/15/21	Thu 7/15/21
14	Remove and Salvage Unlit Information Sign. Demolish Concrete Pad	1 day	Thu 7/15/21	Thu 7/15/21
15	Demolish Electrical Junction Can	1 day	Fri 7/2/21	Fri 7/2/21
16	Demolish Electrical Pullboxes	14 days	Fri 7/2/21	Thu 7/15/21
17	Demolish Airfield Sign and Pad	14 days	Fri 7/2/21	Thu 7/15/21
18	Remove and Salvage Elevated Runway Edge Light Fixture and Transformer. Protect Can	2 days	Tue 6/29/21	Wed 6/30/21
19	Remove and Salvage Elevated Threshold Light Fixture and Transformer. Protect Can	2 days	Tue 6/29/21	Wed 6/30/21
20	Demolish Elevated Taxiway Edge Light and Can. Salvage Existing Fixture	14 days	Fri 7/2/21	Thu 7/15/21
21	Demolish Elevated Runway Edge Light and Can. Salvage Existing Fixture.	1 day	Thu 7/1/21	Thu 7/1/21
22	Demolish In-pavement Runway Edge Light and Can. Salvage Existing Fixture.	1 day	Mon 7/5/21	Mon 7/5/21
23	Demolish MALSF Threshold Bar (13 Lights). Salvage Existing Fixtures	3 days	Wed 6/30/21	Fri 7/2/21
24	Demolish 3 MALSF Centerline Bars (5 Lights Each). Salvage Existing Fixtures	4 days	Sat 7/3/21	Tue 7/6/21
25	Demolish Reinforced Foundation from Abandoned MALSF Bar	1 day	Wed 7/7/21	Wed 7/7/21
26	Demolish Abandoned Waterline, if Encountered	7 days	Fri 7/2/21	Thu 7/8/21
27	Demolish Concrete Valley Gutter	1 day	Wed 7/7/21	Wed 7/7/21
28	Unclassified Excavation and Haul-Off	17 days	Thu 7/1/21	Sat 7/17/21
29	Embankment in Place	10 days	Sat 7/10/21	Mon 7/19/21
30	Subgrade Preparation	19 days	Fri 7/2/21	Tue 7/20/21
31	Place Asphalt Compacted Grindings, 24-inches thick	7 days	Wed 6/30/21	Tue 7/6/21
32	Lime Treated Subgrade, 16-inch Depth (Control Strip)	1 day	Sat 7/3/21	Sat 7/3/21
33	Lime Treated Subgrade, 16-inch Depth (1st Mix)	23 days	Tue 7/6/21	Wed 7/28/21
34	Lime Treated Subgrade, 16-inch Depth (2nd Mix and Compact)	23 days	Tue 7/13/21	Wed 8/4/21
35	In-Place Drying Techniques	19 days	Fri 7/2/21	Tue 7/20/21
36	Subgrade Stabilization, Excavation Below Subgrade	23 days	Fri 7/16/21	Sat 8/7/21
37	Multi-Axial Geogrid	23 days	Fri 7/16/21	Sat 8/7/21
38	Crushed Aggregate Base Course, P-209 (Control Strip)	1 day	Tue 7/20/21	Tue 7/20/21
39	Crushed Aggregate Base Course, P-209 (Pavement Section)	34 days	Sat 7/24/21	Thu 8/26/21
40	Crushed Aggregate Base Course, P-209 (Shoulders)	34 days	Sat 7/24/21	Thu 8/26/21
41	Asphalt Concrete Surface Course, P-401 (Control Strip #1)	1 day	Fri 8/13/21	Fri 8/13/21
42	Asphalt Concrete Surface Course, P-401 (Control Strip #2)	1 day	Fri 8/20/21	Fri 8/20/21

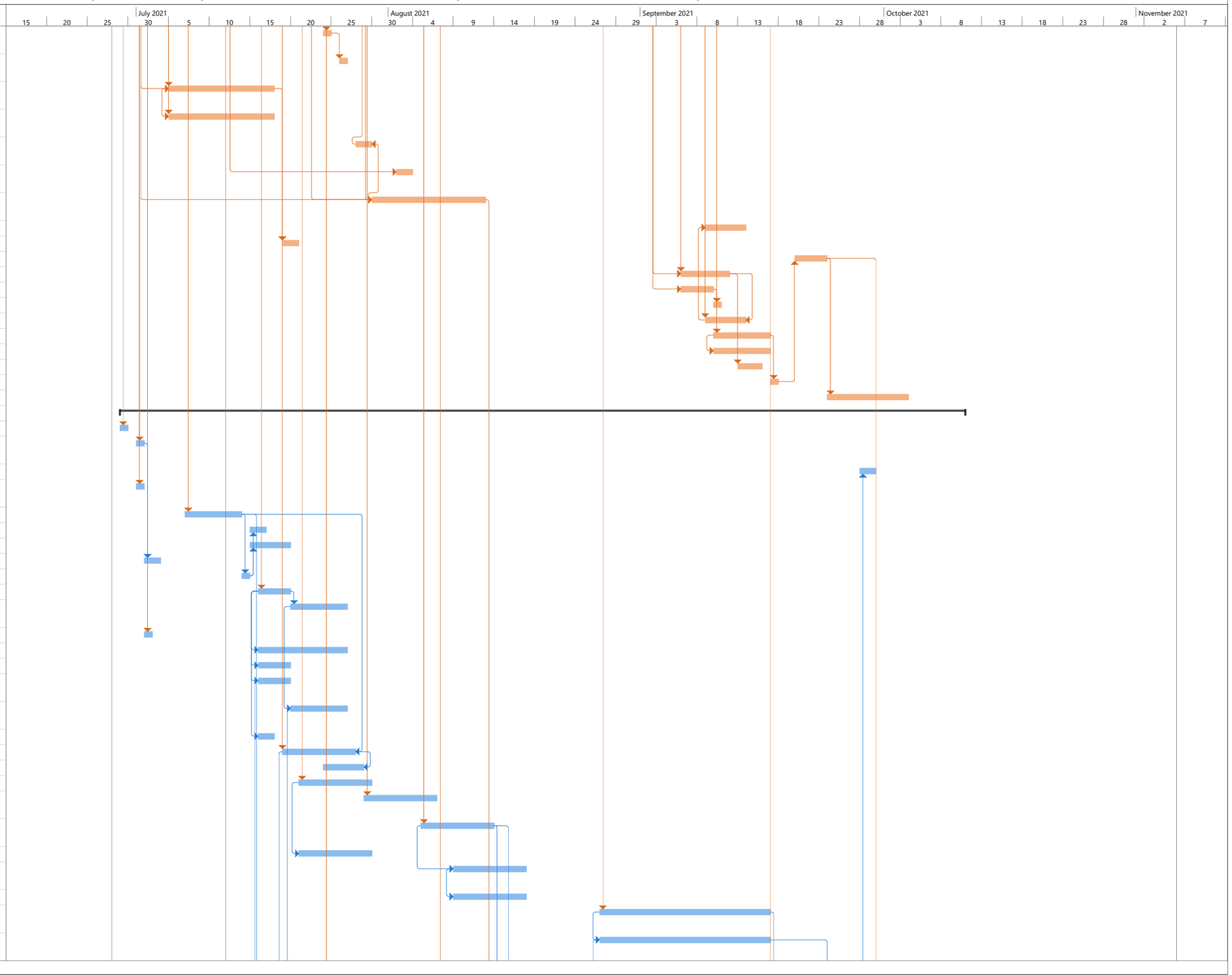


Project: Complete Project Sched
Date: Mon 3/29/21

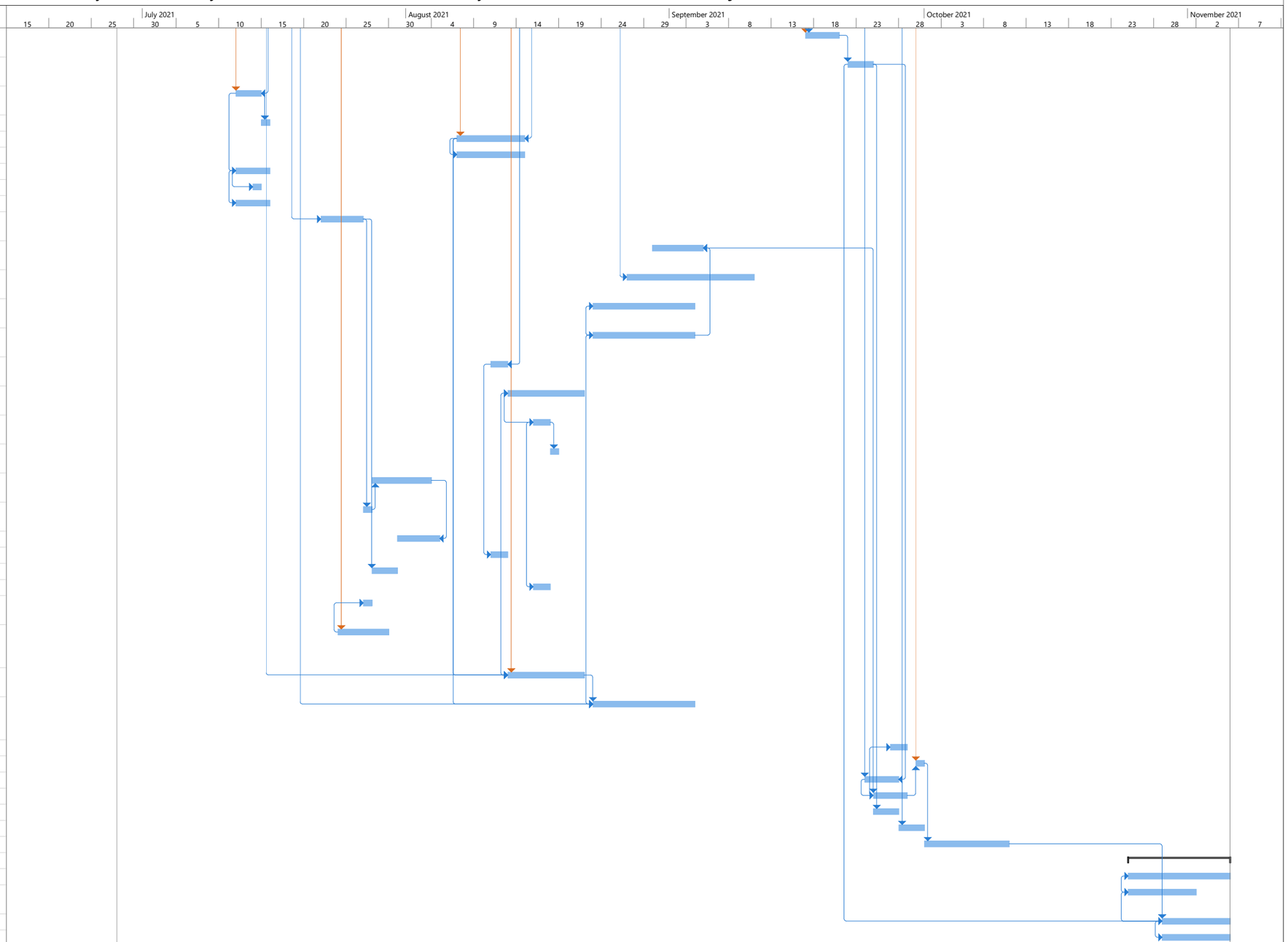
Task · Milestone · Project Summary · Inactive Milestone · Manual Task · Manual Summary Rollup · Start-only · External Tasks · Deadline · Manual Progress
Split · Summary · Inactive Task · Inactive Summary · Duration-only · Manual Summary · Finish-only · External Milestone · Progress

ID	Task Name	Duration	Start	Finish
43	Asphalt Concrete Surface Course, P-401 (First Lift)	7 days	Fri 8/27/21	Thu 9/2/21
44	Asphalt Concrete Surface Course, P-401 (Second Lift)	7 days	Fri 9/3/21	Thu 9/9/21
45	Install 2 Runway Threshold Monuments	1 day	Fri 9/10/21	Fri 9/10/21
46	12-inch RCP, Class IV, outside Pavement Areas	5 days	Fri 7/2/21	Tue 7/6/21
47	12-inch RCP, Class IV, within Pavement Areas	2 days	Wed 7/7/21	Thu 7/8/21
48	Underdrain Pipe, 6-inch, Perforated	15 days	Fri 7/23/21	Fri 8/6/21
49	Underdrain Pipe Cleanouts	15 days	Fri 7/23/21	Fri 8/6/21
50	48" Stormdrain Manholes	7 days	Fri 7/2/21	Thu 7/8/21
51	Catch Basin/Drop Inlet	1 day	Mon 7/5/21	Mon 7/5/21
52	Adjust Catch Basin to Grade	1 day	Tue 7/6/21	Tue 7/6/21
53	Connect to Existing Manholes/Basins	7 days	Fri 7/2/21	Thu 7/8/21
54	Construct Concrete Valley Gutter	2 days	Mon 8/23/21	Tue 8/24/21
55	Controlled Low-Strength Material (CLSM) for Existing Utility Protection	5 days	Mon 7/5/21	Fri 7/9/21
56	No. 8 AWG 5 kV, L-824, Type C Cable, Installed in Duct Bank or Conduit	6 days	Mon 8/9/21	Sat 8/14/21
57	No. 6 AWG Tinned Counterpoise Wire, Installed Adjacent to Duct Bank or Conduit	33 days	Sat 7/24/21	Wed 8/25/21
58	No. 6 AWG Tinned Counterpoise Wire, Installed in Duct Bank or Conduit	17 days	Tue 7/27/21	Thu 8/12/21
59	No. 1/0 AWG Tinned Counterpoise Wire for MALSF, Installed Adjacent to / In the Duct Bank or Conduit	16 days	Wed 7/14/21	Thu 7/29/21
60	No. 2-8 AWG 600V, L-824, Type THWN-2 Cable for MALSF, Installed in Duct Bank or Conduit	16 days	Wed 7/14/21	Thu 7/29/21
61	Concrete Encased Electrical Duct Bank, 3W - 2" Conduit	5 days	Sat 7/31/21	Wed 8/4/21
62	Concrete Encased Electrical Duct Bank, 1W - 2" GRMC Conduit	16 days	Wed 7/14/21	Thu 7/29/21
63	Non-encased Electrical Duct Bank, 1W - 2" Conduit	14 days	Fri 7/30/21	Thu 8/12/21
64	Non-encased Electrical Duct Bank, 2W - 2" Conduit	14 days	Fri 7/30/21	Thu 8/12/21
65	Non-encased Electrical Duct Bank, 1W - 3" and 1W - 2" Conduit	3 days	Tue 7/27/21	Thu 7/29/21
66	Non-encased Electrical Duct Bank, 1W - 3" and 2W - 2" Conduit	3 days	Tue 7/27/21	Fri 7/30/21
67	Non-encased Electrical Duct Bank, 1W - 3" and 3W - 2" Conduit	3 days	Tue 7/27/21	Thu 7/29/21
68	Concrete Encase Existing FAA Line Under Proposed Pavement	5 days	Mon 7/12/21	Fri 7/16/21
69	Concrete Encase Existing FAA Line Outside Pavement	1 day	Sat 7/10/21	Sat 7/10/21
70	Construct Electrical Pullbox: Aircraft Rated	5 days	Sat 7/31/21	Wed 8/4/21
71	Construct FAA Pull Box	1 day	Tue 7/13/21	Wed 7/14/21
72	Construct 24" Junction Can: L-868 with Lid	2 days	Mon 7/26/21	Wed 7/28/21
73	Adjust Junction Can to Grade	1 day	Mon 7/26/21	Mon 7/26/21
74	Construct MALSF Threshold Bar	9 days	Wed 7/14/21	Thu 7/22/21
75	Construct 3 MALSF Centerline Bars	7 days	Fri 7/23/21	Thu 7/29/21
76	MALSF PCC Cure Time	7 edays	Thu 7/29/21	Thu 8/5/21
77	Construct New L-858B(L) Distance Remaining Sign and Concrete Pad	2 days	Mon 7/12/21	Tue 7/13/21
78	Construct New L-858(L) Runway Hold Position Sign and Concrete Pad	5 days	Mon 7/19/21	Fri 7/23/21
79	Construct New L-858(L) Taxiway Guidance Sign, Double Arrow, with Taxiway Identifier and Concrete Pad	5 days	Mon 7/19/21	Fri 7/23/21
80	Construct New L-858(L) Taxiway Guidance Sign, Single Arrow, with Taxiway Identifier and Concrete Pad	5 days	Mon 7/19/21	Fri 7/23/21
81	Construct New L-858(L) Taxiway Guidance Sign without Taxiway Identifier and Concrete Pad	4 days	Wed 7/14/21	Sat 7/17/21

ID	Task Name	Duration	Start	Finish
82	Install Salvaged Unlit Informational Sign on Existing Concrete Pad	1 day	Sat 7/24/21	Sat 7/24/21
83	Install Salvaged Unlit Informational Sign on New Concrete Pad	1 day	Mon 7/26/21	Mon 7/26/21
84	Adjust Base Can for New L-861(L) Elevated Runway Edge Light	13 days	Mon 7/5/21	Sat 7/17/21
85	Adjust Base Can for New L-861E(L) Runway Threshold Light and Transformer	13 days	Mon 7/5/21	Sat 7/17/21
86	Construct New L-861(L) Elevated Runway Edge Light and Base Can	2 days	Wed 7/28/21	Fri 7/30/21
87	Construct New L-852D(L) In-Pavement Runway Edge Light and Base Can	2 days	Mon 8/2/21	Tue 8/3/21
88	Construct New L-861T(L) Medium Intensity Elevated Taxiway Edge Light and Base Can	14 days	Fri 7/30/21	Thu 8/12/21
89	Install ID Tag	5 days	Thu 9/9/21	Mon 9/13/21
90	Install Salvaged REILs on New Concrete Pad	2 days	Mon 7/19/21	Tue 7/20/21
91	Change Sign Legend	4 days	Mon 9/20/21	Thu 9/23/21
92	Shoulder Finishing and Miscellanous Grading	6 days	Mon 9/6/21	Sat 9/11/21
93	Install MALSF Light Fixtures	4 days	Mon 9/6/21	Thu 9/9/21
94	FAA MALSF Inspections	1 day	Fri 9/10/21	Fri 9/10/21
95	Install Runway and Taxiway Light Fixtures	5 days	Thu 9/9/21	Mon 9/13/21
96	Marking, 2 Coats with Beads (First Coat)	7 days	Fri 9/10/21	Thu 9/16/21
97	Marking, 2 Coats with No Beads (First Coat)	7 days	Fri 9/10/21	Thu 9/16/21
98	Hydroseeding	3 days	Mon 9/13/21	Wed 9/15/21
99	Flight Check	1 day	Fri 9/17/21	Fri 9/17/21
100	Float	10 days	Fri 9/24/21	Sun 10/3/21
101	**Work Area 2**	**104 days**	**Tue 6/29/21**	**Sun 10/10/21**
102	Airfield Safety and Traffic Control	1 day	Tue 6/29/21	Tue 6/29/21
103	Compliance with Pollution, Erosion, and Siltation Control	1 day	Thu 7/1/21	Thu 7/1/21
104	Airport Access and Haul Route Repair	2 days	Tue 9/28/21	Wed 9/29/21
105	Underground Utility Investigation and Potholing	1 day	Thu 7/1/21	Thu 7/1/21
106	Demolish Asphalt Pavement	7 days	Wed 7/7/21	Tue 7/13/21
107	Asphalt Crack Repair (under 1.5" width)	2 days	Thu 7/15/21	Fri 7/16/21
108	Asphalt Crack Repair (over 1.5" width)	5 days	Thu 7/15/21	Mon 7/19/21
109	Remove Airfield Marking	2 days	Fri 7/2/21	Sat 7/3/21
110	Cold Mill, Variable Depth (2 inches Maximum)	1 day	Wed 7/14/21	Wed 7/14/21
111	Demolish Conduit, Cable, and Counterpoise	4 days	Fri 7/16/21	Mon 7/19/21
112	Demolish Concrete Encased Conduit, Cable, and Counterpoise	7 days	Tue 7/20/21	Mon 7/26/21
113	Remove Cable and Counterpoise	1 day	Fri 7/2/21	Fri 7/2/21
114	Demolish Electrical Pullbox	11 days	Fri 7/16/21	Mon 7/26/21
115	Demolish Airfield Sign and Pad	4 days	Fri 7/16/21	Mon 7/19/21
116	Demolish Elevated Taxiway Edge Light and Can. Salvage Existing Fixture.	4 days	Fri 7/16/21	Mon 7/19/21
117	Demolish In-pavement Taxiway Edge Light and Can. Salvage Existing Fixture.	7 days	Tue 7/20/21	Mon 7/26/21
118	Demolish Abandoned Waterline, if Encountered	2 days	Fri 7/16/21	Sat 7/17/21
119	Unclassified Excavation and Haul-off	9 days	Mon 7/19/21	Tue 7/27/21
120	Embankment in Place	5 days	Sat 7/24/21	Wed 7/28/21
121	Subgrade Preparation	9 days	Wed 7/21/21	Thu 7/29/21
122	Lime Treated Subgrade, 16-inch Depth (1st Mix)	9 days	Thu 7/29/21	Fri 8/6/21
123	Lime Treated Subgrade, 16-inch Depth (2nd Mix and Compact)	9 days	Thu 8/5/21	Fri 8/13/21
124	In-Place Drying Techniques	9 days	Wed 7/21/21	Thu 7/29/21
125	Subgrade Stabilization, Excavation Below Subgrade	9 days	Mon 8/9/21	Tue 8/17/21
126	Multi-axial Geogrid	9 days	Mon 8/9/21	Tue 8/17/21
127	Crushed Aggregate Base Course, P-209 (Pavement Section)	21 days	Fri 8/27/21	Thu 9/16/21
128	Crushed Aggregate Base Course, P-209 (Shoulders)	21 days	Fri 8/27/21	Thu 9/16/21



ID	Task Name	Duration	Start	Finish
129	Asphalt Concrete Surface Course, P-401 (First Lift)	4 days	Fri 9/17/21	Mon 9/20/21
130	Asphalt Concrete Surface Course, P-401 (Second Lift)	3 days	Wed 9/22/21	Fri 9/24/21
131	12-inch RCP, Class IV, outside Pavement Areas	3 days	Mon 7/12/21	Wed 7/14/21
132	12-inch RCP, Class IV, within Pavement Areas	1 day	Thu 7/15/21	Thu 7/15/21
133	Underdrain Pipe, 6-Inch, Perforated	8 days	Sat 8/7/21	Sat 8/14/21
134	Underdrain Pipe Cleanouts	8 days	Sat 8/7/21	Sat 8/14/21
135	48" Stormdrain Manholes	4 days	Mon 7/12/21	Thu 7/15/21
136	Catch Basin/Drop Inlet	1 day	Wed 7/14/21	Wed 7/14/21
137	Connect to Existing Manholes/Basins	4 days	Mon 7/12/21	Thu 7/15/21
138	Controlled Low-Strength Material (CLSM) for Existing Utility Protection	5 days	Thu 7/22/21	Mon 7/26/21
139	No. 8 AWG 5 kV, L-824, Type C Cable, Installed in Duct Bank or Conduit	6 days	Mon 8/30/21	Sat 9/4/21
140	No. 6 AWG Tinned Counterpoise Wire, Installed Adjacent to Duct Bank or Conduit	15 days	Fri 8/27/21	Fri 9/10/21
141	No. 6 AWG Tinned Counterpoise Wire, Installed in Duct Bank or Conduit	12 days	Mon 8/23/21	Fri 9/3/21
142	Concrete Encased Electrical Duct Bank, 1W - 2" Conduit	12 days	Mon 8/23/21	Fri 9/3/21
143	Concrete Encased Electrical Duct Bank, 5W - 2" Conduit	2 days	Wed 8/11/21	Thu 8/12/21
144	Non-encased Electrical Duct Bank, 1W - 2" Conduit	9 days	Fri 8/13/21	Sat 8/21/21
145	Non-encased Electrical Duct Bank, 2W - 2" Conduit	2 days	Mon 8/16/21	Tue 8/17/21
146	Non-encased Electrical Duct Bank, 3W - 2" Conduit	1 day	Wed 8/18/21	Wed 8/18/21
147	Concrete Encase Existing FAA Line Under Proposed Pavement	7 days	Wed 7/28/21	Tue 8/3/21
148	Concrete Encase Existing FAA Line Outside Pavement	1 day	Tue 7/27/21	Tue 7/27/21
149	Lower and Concrete Encase FAA Line	5 days	Sat 7/31/21	Wed 8/4/21
150	Construct Electrical Pullbox: Aircraft Rated	2 days	Wed 8/11/21	Thu 8/12/21
151	Construct FAA Pull Box	3 days	Wed 7/28/21	Fri 7/30/21
152	Construct 24" Junction Can: L-868 with Lid	2 days	Mon 8/16/21	Tue 8/17/21
153	Construct New L-858(L) ILS Hold Position Sign and Concrete Pad	1 day	Tue 7/27/21	Tue 7/27/21
154	Construct New L-858(L) Taxiway Guidance Sign, Double Arrow, with Taxiway Identifier and Concrete Pad	6 days	Sat 7/24/21	Thu 7/29/21
155	Construct New L-861T(L) Medium Intensity Elevated Taxiway Edge Light and Base Can	9 days	Fri 8/13/21	Sat 8/21/21
156	Construct New L-852T(L) Medium Intensity In-Pavement Taxiway Edge Light and Base Can	12 days	Mon 8/23/21	Fri 9/3/21
157	Install ID Tag	2 days	Mon 9/27/21	Tue 9/28/21
158	Change Sign Legend	1 day	Thu 9/30/21	Thu 9/30/21
159	Shoulder Finishing and Miscellanous Grading	4 days	Fri 9/24/21	Mon 9/27/21
160	Install Taxiway Light Fixtures	4 days	Sat 9/25/21	Tue 9/28/21
161	Marking, 2 Coats with Beads (First Coat)	3 days	Sat 9/25/21	Mon 9/27/21
162	Hydroseeding	3 days	Tue 9/28/21	Thu 9/30/21
163	Float	10 days	Fri 10/1/21	Sun 10/10/21
164	**Phase 2 (Night Closures)**	**12 days**	**Mon 10/25/21**	**Fri 11/5/21**
165	Airfield Safety and Traffic Control	12 days	Mon 10/25/21	Fri 11/5/21
166	Grooving (30 Days after P-401 paving is completed)	8 days	Mon 10/25/21	Mon 11/1/21
167	Marking, 2 Coats with Beads (Second Coat)	8 days	Fri 10/29/21	Fri 11/5/21
168	Marking, Single Coat with No Beads (Second Coat)	8 days	Fri 10/29/21	Fri 11/5/21



Project: Complete Project Sched
Date: Mon 3/29/21

Task · Split · Milestone · Summary · Project Summary · Inactive Task · Inactive Milestone · Inactive Summary · Manual Task · Duration-only · Manual Summary Rollup · Manual Summary · Start-only · Finish-only · External Tasks · External Milestone · Deadline · Progress · Manual Progress

FAA STANDARD SPECIFICATIONS FOR CONSTRUCTION OF AIRPORTS

(from Advisory Circular 150-5370-10H)

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PART 1

FAA General Contract Provisions

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Part 1 – General Contract Provisions

Section 10 Definition of Terms

When the following terms are used in these specifications, in the contract, or in any documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be defined as follows:

Paragraph Number	Term	Definition
10-01	**AASHTO**	The American Association of State Highway and Transportation Officials.
10-02	**Access Road**	The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public roadway.
10-03	**Advertisement**	A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.
10-04	**Airport**	Airport means an area of land or water which is used or intended to be used for the landing and takeoff of aircraft; an appurtenant area used or intended to be used for airport buildings or other airport facilities or rights of way; airport buildings and facilities located in any of these areas, and a heliport.
10-05	**Airport Improvement Program (AIP)**	A grant-in-aid program, administered by the Federal Aviation Administration (FAA).
10-06	**Air Operations Area (AOA)**	The term air operations area (AOA) shall mean any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operation area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.
10-07	**Apron**	Area where aircraft are parked, unloaded or loaded, fueled and/or serviced.
10-08	**ASTM International (ASTM)**	Formerly known as the American Society for Testing and Materials (ASTM).
10-09	**Award**	The Owner's notice to the successful bidder of the acceptance of the submitted bid.
10-10	**Bidder**	Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.

Paragraph Number	Term	Definition
10-11	**Building Area**	An area on the airport to be used, considered, or intended to be used for airport buildings or other airport facilities or rights-of-way together with all airport buildings and facilities located thereon.
10-12	**Calendar Day**	Every day shown on the calendar.
10-13	**Certificate of Analysis (COA)**	The COA is the manufacturer's Certificate of Compliance (COC) including all applicable test results required by the specifications.
10-14	**Certificate of Compliance (COC)**	The manufacturer's certification stating that materials or assemblies furnished fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer's authorized representative.
10-15	**Change Order**	A written order to the Contractor covering changes in the plans, specifications, or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for work within the scope of the contract and necessary to complete the project.
10-16	**Contract**	A written agreement between the Owner and the Contractor that establishes the obligations of the parties including but not limited to performance of work, furnishing of labor, equipment and materials and the basis of payment. The awarded contract includes but may not be limited to: Advertisement, Contract form, Proposal, Performance bond, payment bond, General provisions, certifications and representations, Technical Specifications, Plans, Supplemental Provisions, standards incorporated by reference and issued addenda.
10-17	**Contract Item (Pay Item)**	A specific unit of work for which a price is provided in the contract.
10-18	**Contract Time**	The number of calendar days or working days, stated in the proposal, allowed for completion of the contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the contract shall be completed by that date.
10-19	**Contractor**	The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the contract work.
10-20	**Contractors Quality Control (QC) Facilities**	The Contractor's QC facilities in accordance with the Contractor Quality Control Program (CQCP).

Paragraph Number	Term	Definition
10-21	**Contractor Quality Control Program (CQCP)**	Details the methods and procedures that will be taken to assure that all materials and completed construction required by the contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors.
10-22	**Control Strip**	A demonstration by the Contractor that the materials, equipment, and construction processes results in a product meeting the requirements of the specification.
10-23	**Construction Safety and Phasing Plan (CSPP)**	The overall plan for safety and phasing of a construction project developed by the airport operator, or developed by the airport operator's consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.
10-24	**Drainage System**	The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.
10-25	**Engineer**	The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for engineering, inspection, and/or observation of the contract work and acting directly or through an authorized representative.
10-26	**Equipment**	All machinery, together with the necessary supplies for upkeep and maintenance; and all tools and apparatus necessary for the proper construction and acceptable completion of the work.
10-27	**Extra Work**	An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, but which is found by the Owner's Engineer or Resident Project Representative (RPR) to be necessary to complete the work within the intended scope of the contract as previously modified.
10-28	**FAA**	The Federal Aviation Administration. When used to designate a person, FAA shall mean the Administrator or their duly authorized representative.
10-29	**Federal Specifications**	The federal specifications and standards, commercial item descriptions, and supplements, amendments, and indices prepared and issued by the General Services Administration.

Paragraph Number	Term	Definition
10-30	**Force Account**	**a.** Contract Force Account - A method of payment that addresses extra work performed by the Contractor on a time and material basis. **b.** Owner Force Account - Work performed for the project by the Owner's employees.
10-31	**Intention of Terms**	Whenever, in these specifications or on the plans, the words "directed," "required," "permitted," "ordered," "designated," "prescribed," or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer and/or Resident Project Representative (RPR) is intended; and similarly, the words "approved," "acceptable," "satisfactory," or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer and/or RPR, subject in each case to the final determination of the Owner. Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or cited standard that may be pertinent to such specific reference.
10-32	**Lighting**	A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.
10-33	**Major and Minor Contract Items**	A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 20% of the total amount of the award contract. All other items shall be considered minor contract items.
10-34	**Materials**	Any substance specified for use in the construction of the contract work.
10-35	**Modification of Standards (MOS)**	Any deviation from standard specifications applicable to material and construction methods in accordance with FAA Order 5300.1.
10-36	**Notice to Proceed (NTP)**	A written notice to the Contractor to begin the actual contract work on a previously agreed to date. If applicable, the Notice to Proceed shall state the date on which the contract time begins.
10-37	**Owner**	The term "Owner" shall mean the party of the first part or the contracting agency signatory to the contract. Where the term "Owner" is capitalized in this document, it shall mean airport Sponsor only. The Owner for this project is Ventura County.

Paragraph Number	Term	Definition
10-38	**Passenger Facility Charge (PFC)**	Per 14 Code of Federal Regulations (CFR) Part 158 and 49 United States Code (USC) § 40117, a PFC is a charge imposed by a public agency on passengers enplaned at a commercial service airport it controls.
10-39	**Pavement Structure**	The combined surface course, base course(s), and subbase course(s), if any, considered as a single unit.
10-40	**Payment bond**	The approved form of security furnished by the Contractor and their own surety as a guaranty that the Contractor will pay in full all bills and accounts for materials and labor used in the construction of the work.
10-41	**Performance bond**	The approved form of security furnished by the Contractor and their own surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.
10-42	**Plans**	The official drawings or exact reproductions which show the location, character, dimensions and details of the airport and the work to be done and which are to be considered as a part of the contract, supplementary to the specifications. Plans may also be referred to as 'contract drawings.'
10-43	**Project**	The agreed scope of work for accomplishing specific airport development with respect to a particular airport.
10-44	**Proposal**	The written offer of the bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary materials in accordance with the provisions of the plans and specifications.
10-45	**Proposal guaranty**	The security furnished with a proposal to guarantee that the bidder will enter into a contract if their own proposal is accepted by the Owner.
10-46	**Quality Assurance (QA)**	Owner's responsibility to assure that construction work completed complies with specifications for payment.
10-47	**Quality Control (QC)**	Contractor's responsibility to control material(s) and construction processes to complete construction in accordance with project specifications.
10-48	**Quality Assurance (QA) Inspector**	An authorized representative of the Engineer and/or Resident Project Representative (RPR) assigned to make all necessary inspections, observations, tests, and/or observation of tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

Paragraph Number	Term	Definition
10-49	**Quality Assurance (QA) Laboratory**	The official quality assurance testing laboratories of the Owner or such other laboratories as may be designated by the Engineer or RPR. May also be referred to as Engineer's, Owner's, or QA Laboratory.
10-50	**Resident Project Representative (RPR)**	The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for all necessary inspections, observations, tests, and/or observations of tests of the contract work performed or being performed, or of the materials furnished or being furnished by the Contractor, and acting directly or through an authorized representative.
10-51	**Runway**	The area on the airport prepared for the landing and takeoff of aircraft.
10-52	**Runway Safety Area (RSA)**	A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft. See the construction safety and phasing plan (CSPP) for limits of the RSA.
10-53	**Safety Plan Compliance Document (SPCD)**	Details how the Contractor will comply with the CSPP.
10-54	**Specifications**	A part of the contract containing the written directions and requirements for completing the contract work. Standards for specifying materials or testing which are cited in the contract specifications by reference shall have the same force and effect as if included in the contract physically.
10-55	**Sponsor**	A Sponsor is defined in 49 USC § 47102(24) as a public agency that submits to the FAA for an AIP grant; or a private Owner of a public-use airport that submits to the FAA an application for an AIP grant for the airport.
10-56	**Structures**	Airport facilities such as bridges; culverts; catch basins, inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases; transformers; navigational aids; buildings; vaults; and, other manmade features of the airport that may be encountered in the work and not otherwise classified herein.
10-57	**Subgrade**	The soil that forms the pavement foundation.
10-58	**Superintendent**	The Contractor's executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the RPR, and who shall supervise and direct the construction.
10-59	**Supplemental Agreement**	A written agreement between the Contractor and the Owner that establishes the basis of payment and contract

Paragraph Number	Term	Definition
		time adjustment, if any, for the work affected by the supplemental agreement. A supplemental agreement is required if: (1) in scope work would increase or decrease the total amount of the awarded contract by more than 25%: (2) in scope work would increase or decrease the total of any major contract item by more than 25%; (3) work that is not within the scope of the originally awarded contract; or (4) adding or deleting of a major contract item.
10-60	**Surety**	The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds that are furnished to the Owner by the Contractor.
10-61	**Taxilane**	A taxiway designed for low speed movement of aircraft between aircraft parking areas and terminal areas.
10-62	**Taxiway**	The portion of the air operations area of an airport that has been designated by competent airport authority for movement of aircraft to and from the airport's runways, aircraft parking areas, and terminal areas.
10-63	**Taxiway/Taxilane Safety Area (TSA)**	A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an aircraft. See the construction safety and phasing plan (CSPP) for limits of the TSA.
10-64	**Work**	The furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the Contractor's performance of all duties and obligations imposed by the contract, plans, and specifications.
10-65	**Working day**	A working day shall be any day other than a legal holiday, Saturday, or Sunday on which the normal working forces of the Contractor may proceed with regular work for at least six (6) hours toward completion of the contract. When work is suspended for causes beyond the Contractor's control, it will not be counted as a working day. Saturdays, Sundays and holidays on which the Contractor's forces engage in regular work will be considered as working days.
10-66	**Owner Defined terms:**	
10-66A	**Special Provisions**	Also referred to as Project Specific Requirements for Airport Construction.
10-66B	**Geotechnical Engineering Report**	Geotechnical report(s) prepared specifically for this project by Earth Systems Pacific, dated July 10, 2020 and Addendum, dated July 10, 2020.

END OF SECTION 10

Section 20 Proposal Requirements and Conditions

20-01 Advertisement (Notice to Bidders). The "Advertisement for Bids" included in the front of this Specifications 'Book' has been published at such places and at such times as required by local law or ordinances and is made a part of the "Contract Documents."

The Bid Advertisement provides the following information for Bidders:

- time and place for submitting sealed proposals;
- description of the proposed work;
- instructions about obtaining proposal forms, plans, and specifications;
- Contractor's requirements (license, registration, etc);
- required Federal Provisions solicitation language;
- the proposal guaranty required; and
- the Owner's right to reject any and all bids.

20-02 Qualification of bidders. Each bidder shall submit evidence of competency and evidence of financial responsibility to perform the work to the Owner at the time of bid opening.

Evidence of competency, unless otherwise specified, shall consist of statements covering the bidder's past experience on similar work, and a list of equipment and a list of key personnel that would be available for the work.

Each bidder shall furnish the Owner satisfactory evidence of their financial responsibility. Evidence of financial responsibility, unless otherwise specified, shall consist of a confidential statement or report of the bidder's financial resources and liabilities as of the last calendar year or the bidder's last fiscal year. Such statements or reports shall be certified by a public accountant. At the time of submitting such financial statements or reports, the bidder shall further certify whether their financial responsibility is approximately the same as stated or reported by the public accountant. If the bidder's financial responsibility has changed, the bidder shall qualify the public accountant's statement or report to reflect the bidder's true financial condition at the time such qualified statement or report is submitted to the Owner.

Unless otherwise specified, a bidder may submit evidence that they are prequalified with the State Highway Division and are on the current "bidder's list" of the state in which the proposed work is located. Evidence of State Highway Division prequalification may be submitted as evidence of financial responsibility in lieu of the certified statements or reports specified above.

20-03 Contents of proposal forms. The Owner's proposal forms state the location and description of the proposed construction; the place, date, and time of opening of the proposals; and the estimated quantities of the various items of work to be performed and materials to be furnished for which unit bid prices are asked. The proposal form states the time in which the work must be completed, and the amount of the proposal guaranty that must accompany the proposal. The Owner will accept only those Proposals properly executed on physical forms or electronic forms provided by the Owner. Bidder actions that may cause the Owner to deem a proposal irregular are given in paragraph 20-09 *Irregular proposals*.

Mobilization is limited to 10 percent of the bid schedule in which it is listed.

A non-mandatory prebid conference is required on this project to discuss as a minimum, the following items: material requirements; submittals; Quality Control/Quality Assurance requirements; the construction safety and phasing plan including airport access and staging areas; and unique airfield paving construction requirements. The time, date, and place of the meeting are in the *Notice Inviting Bids.*

20-04 Issuance of proposal forms. The Owner reserves the right to refuse to issue a proposal form to a prospective bidder if the bidder is in default for any of the following reasons:

a. Failure to comply with any prequalification regulations of the Owner, if such regulations are cited, or otherwise included, in the proposal as a requirement for bidding.

b. Failure to pay, or satisfactorily settle, all bills due for labor and materials on former contracts in force with the Owner at the time the Owner issues the proposal to a prospective bidder.

c. Documented record of Contractor default under previous contracts with the Owner.

d. Documented record of unsatisfactory work on previous contracts with the Owner.

20-05 Interpretation of estimated proposal quantities. An estimate of quantities of work to be done and materials to be furnished under these specifications is given in the proposal. It is the result of careful calculations and is believed to be correct. It is given only as a basis for comparison of proposals and the award of the contract. The Owner does not expressly, or by implication, agree that the actual quantities involved will correspond exactly therewith; nor shall the bidder plead misunderstanding or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the work. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications. It is understood that the quantities may be increased or decreased as provided in the Section 40, paragraph 40-02, Alteration of Work and Quantities, without in any way invalidating the unit bid prices.

20-06 Examination of plans, specifications, and site. The bidder is expected to carefully examine the site of the proposed work, the proposal, plans, specifications, and contract forms. Bidders shall satisfy themselves to the character, quality, and quantities of work to be performed, materials to be furnished, and to the requirements of the proposed contract. The submission of a proposal shall be prima facie evidence that the bidder has made such examination and is satisfied to the conditions to be encountered in performing the work and the requirements of the proposed contract, plans, and specifications.

Boring logs and other records of subsurface investigations and tests are available for inspection of bidders. It is understood and agreed that such subsurface information, whether included in the plans, specifications, or otherwise made available to the bidder, was obtained and is intended for the Owner's design and estimating purposes only. Such information has been made available for the convenience of all bidders. It is further understood and agreed that each bidder is solely responsible for all assumptions, deductions, or conclusions which the bidder may make or obtain from their own examination of the boring logs and other records of subsurface investigations and tests that are furnished by the Owner.

20-07 Preparation of proposal. The bidder shall submit their proposal on the forms furnished by the Owner. All blank spaces in the proposal forms, unless explicitly stated otherwise, must be correctly filled in where indicated for each and every item for which a quantity is given. The bidder shall state the price (written in ink or typed) both in words and numerals which they propose for each pay item furnished in the proposal. In case of conflict between words and numerals, the words, unless obviously incorrect, shall govern.

The bidder shall correctly sign the proposal in ink. If the proposal is made by an individual, their name and post office address must be shown. If made by a partnership, the name and post office address of each member of the partnership must be shown. If made by a corporation, the person signing the proposal shall give the name of the state where the corporation was chartered and the name, titles, and business address of the president, secretary, and the treasurer. Anyone signing a proposal as an agent shall file evidence of their authority to do so and that the signature is binding upon the firm or corporation.

20-08 Responsive and responsible bidder. A responsive bid conforms to all significant terms and conditions contained in the Owner's invitation for bid. It is the Owner's responsibility to decide if the exceptions taken by a bidder to the solicitation are material or not and the extent of deviation it is willing to accept.

A responsible bidder has the ability to perform successfully under the terms and conditions of a proposed procurement, as defined in 2 CFR § 200.318(h). This includes such matters as Contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.

20-09 Irregular proposals. Proposals shall be considered irregular for the following reasons:

a. If the proposal is on a form other than that furnished by the Owner, or if the Owner's form is altered, or if any part of the proposal form is detached.

b. If there are unauthorized additions, conditional or alternate pay items, or irregularities of any kind that make the proposal incomplete, indefinite, or otherwise ambiguous.

c. If the proposal does not contain a unit price for each pay item listed in the proposal, except in the case of authorized alternate pay items, for which the bidder is not required to furnish a unit price.

d. If the proposal contains unit prices that are obviously unbalanced.

e. If the proposal is not accompanied by the proposal guaranty specified by the Owner.

f. If the applicable Disadvantaged Business Enterprise information is incomplete.

The Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to local laws and ordinances pertaining to the letting of construction contracts.

20-10 Bid guarantee. Each separate proposal shall be accompanied by a bid bond, certified check, or other specified acceptable collateral, in the amount specified in the proposal form. Such bond, check, or collateral shall be made payable to the Owner.

20-11 Delivery of proposal. See *Notice Inviting Bids* and *Instructions to Bidders.*

20-12 Withdrawal or revision of proposals. A bidder may withdraw or revise (by withdrawal of one proposal and submission of another) a proposal provided that the bidder's request for withdrawal is received by the Owner by email (erin.powers@ventura.org) before the time specified for opening bids. Revised proposals must be received at the place specified in the advertisement before the time specified for opening all bids.

20-13 Public opening of proposals. Proposals shall be opened, and read, publicly at the time and place specified in the advertisement. Bidders, their authorized agents, and other interested persons are invited to attend. Proposals that have been withdrawn (by written or telegraphic request) or received after the time specified for opening bids shall be returned to the bidder unopened.

20-14 Disqualification of bidders. A bidder shall be considered disqualified for any of the following reasons:

a. Submitting more than one proposal from the same partnership, firm, or corporation under the same or different name.

b. Evidence of collusion among bidders. Bidders participating in such collusion shall be disqualified as bidders for any future work of the Owner until any such participating bidder has been reinstated by the Owner as a qualified bidder.

c. If the bidder is considered to be in "default" for any reason specified in paragraph 20-04, *Issuance of Proposal Forms,* of this section.

20-15 Discrepancies and Omissions. A Bidder who discovers discrepancies or omissions with the project bid documents shall immediately notify the Owner's Engineer of the matter. A bidder that has doubt as to the true meaning of a project requirement may submit to the Owner's Engineer a written request for interpretation no later than the RFI deadline.

Any interpretation of the project bid documents by the Owner's Engineer will be by written addendum issued by the Owner. The Owner will not consider any instructions, clarifications or interpretations of the bidding documents in any manner other than written addendum.

END OF SECTION 20

Section 30 Award and Execution of Contract

30-01 Consideration of proposals. After the proposals are publicly opened and read, they will be compared on the basis of the summation of the products obtained by multiplying the estimated quantities shown in the proposal by the unit bid prices. If a bidder's proposal contains a discrepancy between unit bid prices written in words and unit bid prices written in numbers, the unit bid price written in words shall govern.

Until the award of a contract is made, the Owner reserves the right to reject a bidder's proposal for any of the following reasons:

a. If the proposal is irregular as specified in Section 20, paragraph 20-09, *Irregular Proposals*.

b. If the bidder is disqualified for any of the reasons specified Section 20, paragraph 20-14, *Disqualification of Bidders*.

In addition, until the award of a contract is made, the Owner reserves the right to reject any or all proposals, waive technicalities, if such waiver is in the best interest of the Owner and is in conformance with applicable state and local laws or regulations pertaining to the letting of construction contracts; advertise for new proposals; or proceed with the work otherwise. All such actions shall promote the Owner's best interests.

30-02 Award of contract. The award of a contract, if it is to be awarded, shall be made within **120** calendar days of the date specified for publicly opening proposals, unless otherwise specified herein.

If the Owner elects to proceed with an award of contract, the Owner will make award to the responsible bidder whose bid, conforming with all the material terms and conditions of the bid documents, is the lowest in price.

30-03 Cancellation of award. The Owner reserves the right to cancel the award without liability to the bidder, except return of proposal guaranty, at any time before a contract has been fully executed by all parties and is approved by the Owner in accordance with paragraph 30-07 *Approval of Contract*.

30-04 Return of proposal guaranty. All proposal guaranties, except those of the two lowest bidders, will be returned immediately after the Owner has made a comparison of bids as specified in the paragraph 30-01, *Consideration of Proposals.* Proposal guaranties of the two lowest bidders will be retained by the Owner until such time as an award is made, at which time, the unsuccessful bidder's proposal guaranty will be returned. The successful bidder's proposal guaranty will be returned as soon as the Owner receives the contract bonds as specified in paragraph 30-05, *Requirements of Contract Bonds.*

30-05 Requirements of contract bonds. At the time of the execution of the contract, the successful bidder shall furnish the Owner a surety bond or bonds that have been fully executed by the bidder and the surety guaranteeing the performance of the work and the payment of all legal debts that may be incurred by reason of the Contractor's performance of the work. The surety and the form of the bond or bonds shall be acceptable to the Owner. Unless otherwise specified in this subsection, the surety bond or bonds shall be in a sum equal to the full amount of the contract.

30-06 Execution of contract. The successful bidder shall sign (execute) the necessary agreements for entering into the contract and return the signed contract to the Owner, along with the fully executed surety bond or bonds specified in paragraph 30-05, *Requirements of Contract Bonds,* of this section, within 30 calendar days from the date mailed or otherwise delivered to the successful bidder.

30-07 Approval of contract. Upon receipt of the contract and contract bond or bonds that have been executed by the successful bidder, the Owner shall complete the execution of the contract in accordance with local laws or ordinances, and return the fully executed contract to the Contractor. Delivery of the fully executed contract to the Contractor shall constitute the Owner's approval to be bound by the successful bidder's proposal and the terms of the contract.

30-08 Failure to execute contract. Failure of the successful bidder to execute the contract and furnish an acceptable surety bond or bonds within the period specified in paragraph 30-06, *Execution of Contract,* of

this section shall be just cause for cancellation of the award and forfeiture of the proposal guaranty, not as a penalty, but as liquidated damages to the Owner.

END OF SECTION 30

Section 40 Scope of Work

40-01 Intent of contract. The intent of the contract is to provide for construction and completion, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, specifications, and terms of the contract.

40-02 Alteration of work and quantities. The Owner reserves the right to make such changes in quantities and work as may be necessary or desirable to complete, in a satisfactory manner, the original intended work. Unless otherwise specified in the Contract, the Owner's Engineer or RPR shall be and is hereby authorized to make, in writing, such in-scope alterations in the work and variation of quantities as may be necessary to complete the work, provided such action does not represent a significant change in the character of the work.

For purpose of this section, a significant change in character of work means: any change that is outside the current contract scope of work; any change (increase or decrease) in the total contract cost by more than 25%; or any change in the total cost of a major contract item by more than 25%.

Work alterations and quantity variances that do not meet the definition of significant change in character of work shall not invalidate the contract nor release the surety. Contractor agrees to accept payment for such work alterations and quantity variances in accordance with Section 90, paragraph 90-03, *Compensation for Altered Quantities*.

Should the value of altered work or quantity variance meet the criteria for significant change in character of work, such altered work and quantity variance shall be covered by a supplemental agreement. Supplemental agreements shall also require consent of the Contractor's surety and separate performance and payment bonds. If the Owner and the Contractor are unable to agree on a unit adjustment for any contract item that requires a supplemental agreement, the Owner reserves the right to terminate the contract with respect to the item and make other arrangements for its completion.

40-03 Omitted items. The Owner, the Owner's Engineer or the RPR may provide written notice to the Contractor to omit from the work any contract item that does not meet the definition of major contract item. Major contract items may be omitted by a supplemental agreement. Such omission of contract items shall not invalidate any other contract provision or requirement.

Should a contract item be omitted or otherwise ordered to be non-performed, the Contractor shall be paid for all work performed toward completion of such item prior to the date of the order to omit such item. Payment for work performed shall be in accordance with Section 90, paragraph 90-04, *Payment for Omitted Items*.

40-04 Extra work. Should acceptable completion of the contract require the Contractor to perform an item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, Owner may issue a Change Order to cover the necessary extra work. Change orders for extra work shall contain agreed unit prices for performing the change order work in accordance with the requirements specified in the order, and shall contain any adjustment to the contract time that, in the RPR's opinion, is necessary for completion of the extra work.

When determined by the RPR to be in the Owner's best interest, the RPR may order the Contractor to proceed with extra work as provided in Section 90, paragraph 90-05, *Payment for Extra Work*. Extra work that is necessary for acceptable completion of the project, but is not within the general scope of the work covered by the original contract shall be covered by a supplemental agreement as defined in Section 10, paragraph 10-59, *Supplemental Agreement*.

If extra work is essential to maintaining the project critical path, RPR may order the Contractor to commence the extra work under a Time and Material contract method. Once sufficient detail is available to establish the level of effort necessary for the extra work, the Owner shall initiate a change order or supplemental agreement to cover the extra work.

Any claim for payment of extra work that is not covered by written agreement (change order or supplemental agreement) shall be rejected by the Owner.

40-05 Maintenance of traffic. It is the explicit intention of the contract that the safety of aircraft, as well as the Contractor's equipment and personnel, is the most important consideration. The Contractor shall maintain traffic in the manner detailed in the Construction Safety and Phasing Plan (CSPP).

a. It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas (AOAs) of the airport with respect to their own operations and the operations of all subcontractors as specified in Section 80, paragraph 80-04, *Limitation of Operations*. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from, and upon the airport as specified in Section 70, paragraph 70-15, *Contractor's Responsibility for Utility Service and Facilities of Others*.

b. With respect to their own operations and the operations of all subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying personnel, equipment, vehicles, storage areas, and any work area or condition that may be hazardous to the operation of aircraft, fire-rescue equipment, or maintenance vehicles at the airport in accordance with the construction safety and phasing plan (CSPP) and the safety plan compliance document (SPCD).

c. When the contract requires the maintenance of an existing road, street, or highway during the Contractor's performance of work that is otherwise provided for in the contract, plans, and specifications, the Contractor shall keep the road, street, or highway open to all traffic and shall provide maintenance as may be required to accommodate traffic. The Contractor, at their expense, shall be responsible for the repair to equal or better than preconstruction conditions of any damage caused by the Contractor's equipment and personnel. The Contractor shall furnish, erect, and maintain barricades, warning signs, flag person, and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices (MUTCD) (http://mutcd.fhwa.dot.gov/), unless otherwise specified. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways.

40-06 Removal of existing structures. All existing structures encountered within the established lines, grades, or grading sections shall be removed by the Contractor, unless such existing structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the work or to remain in place. The cost of removing such existing structures shall not be measured or paid for directly, but shall be included in the various contract items.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Resident Project Representative (RPR) shall be notified prior to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the RPR in accordance with the provisions of the contract.

Except as provided in Section 40, paragraph 40-07, *Rights in and Use of Materials Found in the Work*, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the work) shall be used in the work as otherwise provided for in the contract and shall remain the property of the Owner when so used in the work.

40-07 Rights in and use of materials found in the work. Should the Contractor encounter any material such as (but not restricted to) sand, stone, gravel, slag, or concrete slabs within the established lines, grades, or grading sections, the use of which is intended by the terms of the contract to be embankment, the Contractor may at their own option either:

a. Use such material in another contract item, providing such use is approved by the RPR and is in conformance with the contract specifications applicable to such use; or,

b. Remove such material from the site, upon written approval of the RPR; or

c. Use such material for the Contractor's own temporary construction on site; or,

d. Use such material as intended by the terms of the contract.

Should the Contractor wish to exercise option a., b., or c., the Contractor shall request the RPR's approval in advance of such use.

Should the RPR approve the Contractor's request to exercise option a., b., or c., the Contractor shall be paid for the excavation or removal of such material at the applicable contract price. The Contractor shall replace, at their expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment, backfills, or otherwise to the extent that such replacement material is needed to complete the contract work. The Contractor shall not be charged for use of such material used in the work or removed from the site.

Should the RPR approve the Contractor's exercise of option a., the Contractor shall be paid, at the applicable contract price, for furnishing and installing such material in accordance with requirements of the contract item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of their own exercise of option a., b., or c.

The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the work, except where such excavation or removal is provided for in the contract, plans, or specifications.

40-08 Final cleanup. Upon completion of the work and before acceptance and final payment will be made, the Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, and stumps or portions of trees. The Contractor shall cut all brush and woods within the limits indicated and shall leave the site in a neat and presentable condition. Material cleared from the site and deposited on adjacent property will not be considered as having been disposed of satisfactorily, unless the Contractor has obtained the written permission of the property Owner.

END OF SECTION 40

Section 50 Control of Work

50-01 Authority of the Resident Project Representative (RPR). The RPR has final authority regarding the interpretation of project specification requirements. The RPR shall determine acceptability of the quality of materials furnished, method of performance of work performed, and the manner and rate of performance of the work. The RPR does not have the authority to accept work that does not conform to specification requirements.

50-02 Conformity with plans and specifications. All work and all materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross-sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the contract, plans, or specifications.

If the RPR finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications, but that the portion of the work affected will, in their opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the Owner, the RPR will advise the Owner of their determination that the affected work be accepted and remain in place. The RPR will document the determination and recommend to the Owner a basis of acceptance that will provide for an adjustment in the contract price for the affected portion of the work. Changes in the contract price must be covered by contract change order or supplemental agreement as applicable.

If the RPR finds the materials furnished, work performed, or the finished product are not in reasonably close conformity with the plans and specifications and have resulted in an unacceptable finished product, the affected work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor in accordance with the RPR's written orders.

The term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the contract, plans, and specifications. The term shall not be construed as waiving the RPR's responsibility to insist on strict compliance with the requirements of the contract, plans, and specifications during the Contractor's execution of the work, when, in the RPR's opinion, such compliance is essential to provide an acceptable finished portion of the work.

The term "reasonably close conformity" is also intended to provide the RPR with the authority, after consultation with the Sponsor and FAA, to use sound engineering judgment in their determinations to accept work that is not in strict conformity, but will provide a finished product equal to or better than that required by the requirements of the contract, plans and specifications.

The RPR will not be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction or the safety precautions incident thereto.

50-03 Coordination of contract, plans, and specifications. The contract, plans, specifications, and all referenced standards cited are essential parts of the contract requirements. If electronic files are provided and used on the project and there is a conflict between the electronic files and hard copy plans, the hard copy plans shall govern. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; contract technical specifications shall govern over contract general provisions, plans, cited standards for materials or testing, and cited advisory circulars (ACs); contract general provisions shall govern over plans, cited standards for materials or testing, and cited ACs; plans shall govern over cited standards for materials or testing and cited ACs. If any paragraphs contained in the Special Provisions conflict with General Provisions or Technical Specifications, the Special Provisions shall govern.

From time to time, discrepancies within cited testing standards occur due to the timing of the change, edits, and/or replacement of the standards. If the Contractor discovers any apparent discrepancy within standard test methods, the Contractor shall immediately ask the RPR for an interpretation and decision, and such decision shall be final.

The Contractor shall not take advantage of any apparent error or omission on the plans or specifications. In the event the Contractor discovers any apparent error or discrepancy, Contractor shall immediately notify the Owner or the designated representative in writing requesting their written interpretation and decision.

50-04 List of Special Provisions. Special Provisions and Order of Precedence are listed in *County of Ventura Standard Specifications Section 2.5.2.*

50-05 Cooperation of Contractor. The Contractor shall be supplied with **one** hard copy or an electronic PDF of the plans and specifications. The Contractor shall have available on the construction site at all times one hardcopy each of the plans and specifications.

The Contractor shall give constant attention to the work to facilitate the progress thereof, and shall cooperate with the RPR and their inspectors and with other Contractors in every way possible. The Contractor shall have a competent superintendent on the work at all times who is fully authorized as their agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the RPR or their authorized representative.

50-06 Cooperation between Contractors. The Owner reserves the right to contract for and perform other or additional work on or near the work covered by this contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct the work not to interfere with or hinder the progress of completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with their own contract and shall protect and hold harmless the Owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange their work and shall place and dispose of the materials being used to not interfere with the operations of the other Contractors within the limits of the same project. The Contractor shall join their work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

50-07 Construction layout and stakes. The Engineer/RPR shall establish necessary horizontal and vertical control. The establishment of Survey Control and/or reestablishment of survey control shall be by a State Licensed Land Surveyor. Contractor is responsible for preserving integrity of horizontal and vertical controls established by Engineer/RPR. In case of negligence on the part of the Contractor or their employees, resulting in the destruction of any horizontal and vertical control, the resulting costs will be deducted as a liquidated damage against the Contractor.

Prior to the start of construction, the Contractor will check all control points for horizontal and vertical accuracy and certify in writing to the RPR that the Contractor concurs with survey control established for the project. All lines, grades and measurements from control points necessary for the proper execution and control of the work on this project will be provided to the RPR. The Contractor is responsible to establish all layout required for the construction of the project.

Copies of survey notes will be provided to the RPR for each area of construction and for each placement of material as specified to allow the RPR to make periodic checks for conformance with plan grades, alignments and grade tolerances required by the applicable material specifications. Surveys will be provided to the RPR prior to commencing work items that cover or disturb the survey staking. Survey(s) and notes shall be provided in the following format(s): **Electronic PDF and AutoCAD 2020**.

Laser, GPS, String line, or other automatic control shall be checked with temporary control as necessary. In the case of error, on the part of the Contractor, their surveyor, employees or subcontractors, resulting in established grades, alignment or grade tolerances that do not concur with those specified or shown on the plans, the Contractor is solely responsible for correction, removal, replacement and all associated costs at no additional cost to the Owner.

No direct payment will be made, unless otherwise specified in contract documents, for this labor, materials, or other expenses. The cost shall be included in the price of the bid for the various items of the Contract.

50-08 Authority and duties of Quality Assurance (QA) inspectors. QA inspectors shall be authorized to inspect all work done and all material furnished. Such QA inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. QA inspectors are not authorized to revoke, alter, or waive any provision of the contract. QA inspectors are not authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

QA Inspectors are authorized to notify the Contractor or their representatives of any failure of the work or materials to conform to the requirements of the contract, plans, or specifications and to reject such nonconforming materials in question until such issues can be referred to the RPR for a decision.

50-09 Inspection of the work. All materials and each part or detail of the work shall be subject to inspection. The RPR shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the RPR requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be at the Contractor's expense.

Provide advance written notice to the RPR of work the Contractor plans to perform each week and each day. Any work done or materials used without written notice and allowing opportunity for inspection by the RPR may be ordered removed and replaced at the Contractor's expense.

Should the contract work include relocation, adjustment, or any other modification to existing facilities, not the property of the (contract) Owner, authorized representatives of the Owners of such facilities shall have the right to inspect such work. Such inspection shall in no sense make any facility owner a party to the contract, and shall in no way interfere with the rights of the parties to this contract.

50-10 Removal of unacceptable and unauthorized work. All work that does not conform to the requirements of the contract, plans, and specifications will be considered unacceptable, unless otherwise determined acceptable by the RPR as provided in paragraph 50-02, *Conformity with Plans and Specifications*.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of Section 70, paragraph 70-14, *Contractor's Responsibility for Work*.

No removal work made under provision of this paragraph shall be done without lines and grades having been established by the RPR. Work done contrary to the instructions of the RPR, work done beyond the lines shown on the plans or as established by the RPR, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply with any order of the RPR made under the provisions of this subsection, the RPR will have authority to cause unacceptable work to be remedied or removed and replaced; and unauthorized work to be removed and recover the resulting costs as a liquidated damage against the Contractor.

50-11 Load restrictions. The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage that may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor, at their own expense, shall be responsible for the repair to equal or better than preconstruction conditions of any damage caused by the Contractor's equipment and personnel.

50-12 Maintenance during construction. The Contractor shall maintain the work during construction and until the work is accepted. Maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.

In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various contract items, and the Contractor will not be paid an additional amount for such work.

50-13 Failure to maintain the work. Should the Contractor at any time fail to maintain the work as provided in paragraph 50-12, *Maintenance during Construction*, the RPR shall immediately notify the Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the RPR's notification, the Owner may suspend any work necessary for the Owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Owner, shall be recovered as a liquidated damage against the Contractor.

50-14 Partial acceptance. If at any time during the execution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the Owner, the Contractor may request the RPR to make final inspection of that unit. If the RPR finds upon inspection that the unit has been satisfactorily completed in compliance with the contract, the RPR may accept it as being complete, and the Contractor may be relieved of further responsibility for that unit. Such partial acceptance and beneficial occupancy by the Owner shall not void or alter any provision of the contract.

50-15 Final acceptance. Upon due notice from the Contractor of presumptive completion of the entire project, the RPR and Owner will make an inspection. If all construction provided for and contemplated by the contract is found to be complete in accordance with the contract, plans, and specifications, such inspection shall constitute the final inspection. The RPR shall notify the Contractor in writing of final acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the RPR will notify the Contractor and the Contractor shall correct the unsatisfactory work. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the RPR will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

50-16 Claims for adjustment and disputes. If for any reason the Contractor deems that additional compensation is due for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, the Contractor shall notify the RPR in writing of their intention to claim such additional compensation before the Contractor begins the work on which the Contractor bases the claim. If such notification is not given or the RPR is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor and the fact that the RPR has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the

Contractor shall, within 10 calendar days, submit a written claim to the RPR who will present it to the Owner for consideration in accordance with local laws or ordinances.

Nothing in this subsection shall be construed as a waiver of the Contractor's right to dispute final payment based on differences in measurements or computations.

END OF SECTION 50

Section 60 Control of Materials

60-01 Source of supply and quality requirements. The materials used in the work shall conform to the requirements of the contract, plans, and specifications. Unless otherwise specified, such materials that are manufactured or processed shall be new (as compared to used or reprocessed).

In order to expedite the inspection and testing of materials, the Contractor shall furnish documentation to the RPR as to the origin, composition, and manufacture of all materials to be used in the work. Documentation shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials.

At the RPR's option, materials may be approved at the source of supply before delivery. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

The Contractor shall furnish airport lighting equipment that meets the requirements of the specifications; and is listed in AC 150/5345-53, *Airport Lighting Equipment Certification Program* and *Addendum*, that is in effect on the date of advertisement.

60-02 Samples, tests, and cited specifications. All materials used in the work shall be inspected, tested, and approved by the RPR before incorporation in the work unless otherwise designated. Any work in which untested materials are used without approval or written permission of the RPR shall be performed at the Contractor's risk. Materials found to be unacceptable and unauthorized will not be paid for and, if directed by the RPR, shall be removed at the Contractor's expense.

Unless otherwise designated, quality assurance tests will be made by and at the expense of the Owner in accordance with the cited standard methods of ASTM, American Association of State Highway and Transportation Officials (AASHTO), federal specifications, Commercial Item Descriptions, and all other cited methods, which are current on the date of advertisement for bids.

The testing organizations performing on-site quality assurance field tests shall have copies of all referenced standards on the construction site for use by all technicians and other personnel. Unless otherwise designated, samples for quality assurance will be taken by a qualified representative of the RPR. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the work. Copies of all tests will be furnished to the Contractor's representative at their request after review and approval of the RPR.

A copy of all Contractor QC test data shall be provided to the RPR daily, along with printed reports, in an approved format, on a weekly basis. After completion of the project, and prior to final payment, the Contractor shall submit a final report to the RPR showing all test data reports, plus an analysis of all results showing ranges, averages, and corrective action taken on all failing tests.

The Contractor shall employ a Quality Control (QC) testing organization to perform all Contractor required QC tests in accordance with Item C-100 Contractor Quality Control Program (CQCP).

60-03 Certification of compliance/analysis (COC/COA). The RPR may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's COC stating that such materials or assemblies fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified. The COA is the manufacturer's COC and includes all applicable test results.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time and if found not to be in conformity with contract requirements will be subject to rejection whether in place or not.

The form and distribution of certificates of compliance shall be as approved by the RPR.

When a material or assembly is specified by "brand name or equal" and the Contractor elects to furnish the specified "or equal," the Contractor shall be required to furnish the manufacturer's certificate of compliance

for each lot of such material or assembly delivered to the work. Such certificate of compliance shall clearly identify each lot delivered and shall certify as to:

a. Conformance to the specified performance, testing, quality or dimensional requirements; and,

b. Suitability of the material or assembly for the use intended in the contract work.

The RPR shall be the sole judge as to whether the proposed “or equal” is suitable for use in the work.

The RPR reserves the right to refuse permission for use of materials or assemblies on the basis of certificates of compliance.

60-04 Plant inspection. The RPR or their authorized representative may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work and to obtain samples required for acceptance of the material or assembly.

Should the RPR conduct plant inspections, the following conditions shall exist:

a. The RPR shall have the cooperation and assistance of the Contractor and the producer with whom the Contractor has contracted for materials.

b. The RPR shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.

c. If required by the RPR, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Place office or working space in a convenient location with respect to the plant.

It is understood and agreed that the Owner shall have the right to retest any material that has been tested and approved at the source of supply after it has been delivered to the site. The RPR shall have the right to reject only material which, when retested, does not meet the requirements of the contract, plans, or specifications.

60-05 Engineer/ Resident Project Representative (RPR) field office. The Contractor shall provide dedicated space for the use of the engineer, RPR, and inspectors, as a field office for the duration of the project. This space shall be located conveniently near the construction and shall be separate from any space used by the Contractor. The Contractor shall furnish water, sanitary facilities, heat, air conditioning, and electricity.

60-06 Storage of materials. Materials shall be stored to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the RPR. Materials to be stored on airport property shall not create an obstruction to air navigation nor shall they interfere with the free and unobstructed movement of aircraft. Unless otherwise shown on the plans and/or CSPP, the storage of materials and the location of the Contractor’s plant and parked equipment or vehicles shall be as directed by the RPR. Private property shall not be used for storage purposes without written permission of the Owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the RPR a copy of the property Owner’s permission.

All storage sites on private or airport property shall be restored to their original condition by the Contractor at their expense, except as otherwise agreed to (in writing) by the Owner or lessee of the property.

60-07 Unacceptable materials. Any material or assembly that does not conform to the requirements of the contract, plans, or specifications shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the work, unless otherwise instructed by the RPR.

Rejected material or assembly, the defects of which have been corrected by the Contractor, shall not be returned to the site of the work until such time as the RPR has approved its use in the work.

60-08 Owner furnished materials. The Contractor shall furnish all materials required to complete the work, except those specified, if any, to be furnished by the Owner. Owner-furnished materials shall be made available to the Contractor at the location specified.

All costs of handling, transportation from the specified location to the site of work, storage, and installing Owner-furnished materials shall be included in the unit price bid for the contract item in which such Owner-furnished material is used.

After any Owner-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies that may occur during the Contractor's handling, storage, or use of such Owner-furnished material. The Owner will deduct from any monies due or to become due the Contractor any cost incurred by the Owner in making good such loss due to the Contractor's handling, storage, or use of Owner-furnished materials.

END OF SECTION 60

Section 70 Legal Regulations and Responsibility to Public

70-01 Laws to be observed. The Contractor shall keep fully informed of all federal and state laws, all local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. The Contractor shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the Owner and all their officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or the Contractor's employees.

70-02 Permits, licenses, and taxes. The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful execution of the work.

70-03 Patented devices, materials, and processes. If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, the Contractor shall provide for such use by suitable legal agreement with the Patentee or Owner. The Contractor and the surety shall indemnify and hold harmless the Owner, any third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Owner for any costs, expenses, and damages which it may be obliged to pay by reason of an infringement, at any time during the execution or after the completion of the work.

70-04 Restoration of surfaces disturbed by others. The Owner reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, FAA or National Oceanic and Atmospheric Administration (NOAA) facility, or a utility service of another government agency at any time during the progress of the work. To the extent that such construction, reconstruction, or maintenance has been coordinated with the Owner, such authorized work (by others) must be shown on the plans.

Except as listed above, the Contractor shall not permit any individual, firm, or corporation to excavate or otherwise disturb such utility services or facilities located within the limits of the work without the written permission of the RPR.

Should the Owner of public or private utility service, FAA, or NOAA facility, or a utility service of another government agency be authorized to construct, reconstruct, or maintain such utility service or facility during the progress of the work, the Contractor shall cooperate with such Owners by arranging and performing the work in this contract to facilitate such construction, reconstruction or maintenance by others whether or not such work by others is listed above. When ordered as extra work by the RPR, the Contractor shall make all necessary repairs to the work which are due to such authorized work by others, unless otherwise provided for in the contract, plans, or specifications. It is understood and agreed that the Contractor shall not be entitled to make any claim for damages due to such authorized work by others or for any delay to the work resulting from such authorized work.

70-05 Federal Participation. The United States Government has agreed to reimburse the Owner for some portion of the contract costs. The contract work is subject to the inspection and approval of duly authorized representatives of the FAA Administrator. No requirement of this contract shall be construed as making the United States a party to the contract nor will any such requirement interfere, in any way, with the rights of either party to the contract.

70-06 Sanitary, health, and safety provisions. The Contractor's worksite and facilities shall comply with applicable federal, state, and local requirements for health, safety and sanitary provisions.

70-07 Public convenience and safety. The Contractor shall control their operations and those of their subcontractors and all suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration.

The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to their own operations and those of their own subcontractors and all suppliers in accordance with

Section 40, paragraph 40-05, *Maintenance of Traffic,* and shall limit such operations for the convenience and safety of the traveling public as specified in Section 80, paragraph 80-04, *Limitation of Operations*.

The Contractor shall remove or control debris and rubbish resulting from its work operations at frequent intervals, and upon the order of the RPR. If the RPR determines the existence of Contractor debris in the work site represents a hazard to airport operations and the Contractor is unable to respond in a prompt and reasonable manner, the RPR reserves the right to assign the task of debris removal to a third party and recover the resulting costs as a liquidated damage against the Contractor.

70-08 Construction Safety and Phasing Plan (CSPP). The Contractor shall complete the work in accordance with the approved Construction Safety and Phasing Plan (CSPP) developed in accordance with AC 150/5370-2, Operational Safety on Airports During Construction. The CSPP is on the G-series of sheets and included as Part 2 of the Project Specific Requirements for Airport Construction.

70-09 Use of explosives. The use of explosives is not permitted on this project.

70-10 Protection and restoration of property and landscape. The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer/RPR has witnessed or otherwise referenced their location and shall not move them until directed.

The Contractor shall be responsible for all damage or injury to property of any character, during the execution of the work, resulting from any act, omission, neglect, or misconduct in manner or method of executing the work, or at any time due to defective work or materials, and said responsibility shall not be released until the project has been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the non-execution thereof by the Contractor, the Contractor shall restore, at their expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, or otherwise restoring as may be directed, or the Contractor shall make good such damage or injury in an acceptable manner.

70-11 Responsibility for damage claims. The Contractor shall indemnify and hold harmless the Engineer/RPR and the Owner and their officers, agents, and employees from all suits, actions, or claims, of any character, brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of said Contractor; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the “Workmen’s Compensation Act,” or any other law, ordinance, order, or decree. Money due the Contractor under and by virtue of their own contract considered necessary by the Owner for such purpose may be retained for the use of the Owner or, in case no money is due, their own surety may be held until such suits, actions, or claims for injuries or damages shall have been settled and suitable evidence to that effect furnished to the Owner, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that he or she is adequately protected by public liability and property damage insurance.

70-12 Third party beneficiary clause. It is specifically agreed between the parties executing the contract that it is not intended by any of the provisions of any part of the contract to create for the public or any member thereof, a third-party beneficiary or to authorize anyone not a party to the contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of the contract.

70-13 Opening sections of the work to traffic. If it is necessary for the Contractor to complete portions of the contract work for the beneficial occupancy of the Owner prior to completion of the entire contract, such “phasing” of the work must be indicated on the approved Construction Safety and Phasing Plan

(CSPP) and the project plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified.

Upon completion of any portion of work listed above, such portion shall be accepted by the Owner in accordance with Section 50, paragraph 50-14, *Partial Acceptance*.

No portion of the work may be opened by the Contractor until directed by the Owner in writing. Should it become necessary to open a portion of the work to traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the RPR, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the Owner shall be repaired by the Contractor at their expense.

The Contractor shall make their own estimate of the inherent difficulties involved in completing the work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the contract work.

The Contractor must conform to safety standards contained AC 150/5370-2 and the approved CSPP.

Contractor shall refer to the plans, specifications, and the approved CSPP to identify barricade requirements, temporary and/or permanent markings, airfield lighting, guidance signs and other safety requirements prior to opening up sections of work to traffic.

70-14 Contractor's responsibility for work. Until the RPR's final written acceptance of the entire completed work, excepting only those portions of the work accepted in accordance with Section 50, paragraph 50-14, *Partial Acceptance*, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of government authorities.

If the work is suspended for any cause whatever, the Contractor shall be responsible for the work and shall take such precautions necessary to prevent damage to the work. The Contractor shall provide for normal drainage and shall erect necessary temporary structures, signs, or other facilities at their own expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established planting, seeding, and sodding furnished under the contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

70-15 Contractor's responsibility for utility service and facilities of others. As provided in paragraph 70-04, *Restoration of Surfaces Disturbed by Others*, the Contractor shall cooperate with the owner of any public or private utility service, FAA or NOAA, or a utility service of another government agency that may be authorized by the Owner to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the Contractor shall control their operations to prevent the unscheduled interruption of such utility services and facilities.

To the extent that such public or private utility services, FAA, or NOAA facilities, or utility services of another governmental agency are known to exist within the limits of the contract work, the approximate locations have been indicated on the plans and/or in the contract documents.

It is understood and agreed that the Owner does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown on the plans or encountered in the work. Any inaccuracy or omission in such information shall not relieve the Contractor of the responsibility to protect such existing features from damage or unscheduled interruption of service.

It is further understood and agreed that the Contractor shall, upon execution of the contract, notify the Owners of all utility services or other facilities of their plan of operations. Such notification shall be in writing addressed to "The Person to Contact" as provided in this paragraph and paragraph 70-04, *Restoration of Surfaces Disturbed By Others*. A copy of each notification shall be given to the RPR.

In addition to the general written notification provided, it shall be the responsibility of the Contractor to keep such individual Owners advised of changes in their plan of operations that would affect such Owners.

Prior to beginning the work in the general vicinity of an existing utility service or facility, the Contractor shall again notify each such Owner of their plan of operation. If, in the Contractor's opinion, the Owner's assistance is needed to locate the utility service or facility or the presence of a representative of the Owner is desirable to observe the work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility owner's "Person to Contact" no later than two normal business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall furnish a written summary of the notification to the RPR.

The Contractor's failure to give the two days' notice shall be cause for the Owner to suspend the Contractor's operations in the general vicinity of a utility service or facility.

Where the outside limits of an underground utility service have been located and staked on the ground, the Contractor shall be required to use hand excavation methods within 3 feet (1 m) of such outside limits at such points as may be required to ensure protection from damage due to the Contractor's operations.

Should the Contractor damage or interrupt the operation of a utility service or facility by accident or otherwise, the Contractor shall immediately notify the proper authority and the RPR and shall take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events, shall cooperate with the utility service or facility owner and the RPR continuously until such damage has been repaired and service restored to the satisfaction of the utility or facility owner.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to their operations whether due to negligence or accident. The Owner reserves the right to deduct such costs from any monies due or which may become due the Contractor, or their own surety.

70-15.1 FAA facilities and cable runs. The Contractor is hereby advised that the construction limits of the project include existing facilities and buried cable runs that are owned, operated and maintained by the FAA. The Contractor, during the execution of the project work, shall comply with the following:

a. The Contractor shall permit FAA maintenance personnel the right of access to the project work site for purposes of inspecting and maintaining all existing FAA owned facilities.

b. The Contractor shall provide notice to the FAA Air Traffic Organization (ATO)/Technical Operations/System Support Center (SSC) Point-of-Contact through the airport Operator a minimum of seven (7) calendar days prior to commencement of construction activities in order to permit sufficient time to locate and mark existing buried cables and to schedule any required facility outages.

c. If execution of the project work requires a facility outage, the Contractor shall contact the FAA Point-of-Contact a minimum of 72 hours prior to the time of the required outage.

d. Any damage to FAA cables, access roads, or FAA facilities during construction caused by the Contractor's equipment or personnel whether by negligence or accident will require the Contractor to repair or replace the damaged cables, access road, or FAA facilities to FAA requirements. The Contractor shall not bear the cost to repair damage to underground facilities or utilities improperly located by the FAA.

e. If the project work requires the cutting or splicing of FAA owned cables, the FAA Point-of-Contact shall be contacted a minimum of 72 hours prior to the time the cable work commences. The FAA reserves the right to have a FAA representative on site to observe the splicing of the cables as a condition of acceptance. All cable splices are to be accomplished in accordance with FAA specifications and require approval by the FAA Point-of-Contact as a condition of acceptance by the Owner. The Contractor is hereby advised that FAA restricts the location of where splices may be installed. If a cable splice is required in a location that is not permitted by FAA, the Contractor shall furnish and install a sufficient length of new cable that eliminates the need for any splice.

70-16 Furnishing rights-of-way. The Owner will be responsible for furnishing all rights-of-way upon which the work is to be constructed in advance of the Contractor's operations.

70-17 Personal liability of public officials. In carrying out any of the contract provisions or in exercising any power or authority granted by this contract, there shall be no liability upon the Engineer, RPR, their authorized representatives, or any officials of the Owner either personally or as an official of the Owner. It is understood that in such matters they act solely as agents and representatives of the Owner.

70-18 No waiver of legal rights. Upon completion of the work, the Owner will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the Owner from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Owner be precluded or stopped from recovering from the Contractor or their surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill their obligations under the contract. A waiver on the part of the Owner of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract, shall be liable to the Owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Owner's rights under any warranty or guaranty.

70-19 Environmental protection. The Contractor shall comply with all federal, state, and local laws and regulations controlling pollution of the environment. The Contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, asphalts, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

70-20 Archaeological and historical findings. Unless otherwise specified in this subsection, the Contractor is advised that the site of the work is not within any property, district, or site, and does not contain any building, structure, or object listed in the current National Register of Historic Places published by the United States Department of Interior.

Should the Contractor encounter, during their operations, any building, part of a building, structure, or object that is incongruous with its surroundings, the Contractor shall immediately cease operations in that location and notify the RPR. The RPR will immediately investigate the Contractor's finding and the Owner will direct the Contractor to either resume operations or to suspend operations as directed.

Should the Owner order suspension of the Contractor's operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract change order or supplemental agreement as provided in Section 40, paragraph 40-04, *Extra Work,* and Section 90, paragraph 90-05, *Payment for Extra Work*. If appropriate, the contract change order or supplemental agreement shall include an extension of contract time in accordance with Section 80, paragraph 80-07, *Determination and Extension of Contract Time*.

70-21 Insurance Requirements. See Section 7.4 of the County of Ventura Standard Specifications for insurance requirements.

END OF SECTION 70

Section 80 Execution and Progress

80-01 Subletting of contract. The Owner will not recognize any subcontractor on the work. The Contractor shall at all times when work is in progress be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Resident Project Representative (RPR).

The Contractor shall perform, with his organization, an amount of work equal to at least 60 percent of the total contract cost.

Should the Contractor elect to assign their contract, said assignment shall be concurred in by the surety, shall be presented for the consideration and approval of the Owner, and shall be consummated only on the written approval of the Owner.

The Contractor shall provide copies of all subcontracts to the RPR before the Notice to Proceed for construction. As a minimum, the information shall include the following:

- Subcontractor's legal company name.
- Subcontractor's legal company address, including County name.
- Principal contact person's name, telephone and fax number.
- Complete narrative description, and dollar value of the work to be performed by the subcontractor.
- Copies of required insurance certificates in accordance with the specifications.
- Minority/ non-minority status.
- Federal Contract Provisions for Airport Improvement Program Projects must be included in-full in the contract. These cannot be included by reference only; they must be in the signed documents provided to the RPR.

80-02 Notice to proceed (NTP). The Owners notice to proceed will state the date on which contract time commences. The Contractor is expected to commence project operations within **10** days of the NTP date. The Contractor shall notify the RPR at least 24 hours in advance of the time contract operations begins. The Contractor shall not commence any actual operations prior to the date on which the notice to proceed is issued by the Owner.

80-03 Execution and progress. Unless otherwise specified, the Contractor shall submit their coordinated construction schedule showing all work activities for the RPR's review and acceptance at least 10 days prior to the start of work. The Contractor's progress schedule, once accepted by the RPR, will represent the Contractor's baseline plan to accomplish the project in accordance with the terms and conditions of the Contract. The RPR will compare actual Contractor progress against the baseline schedule to determine that status of the Contractor's performance. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the proposal.

If the Contractor falls significantly behind the submitted schedule, the Contractor shall, upon the RPR's request, submit a revised schedule for completion of the work within the contract time and modify their operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the execution of the work be discontinued for any reason, the Contractor shall notify the RPR at least 24 hours in advance of resuming operations.

The Contractor shall not commence any actual construction prior to the date on which the NTP is issued by the Owner.

The project schedule shall be prepared as a network diagram in Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), or other format, or as otherwise specified. It shall include information on the sequence of work activities, milestone dates, and activity duration. The schedule shall

show all work items identified in the project proposal for each work area and shall include the project start date and end date.

The Contractor shall maintain the work schedule and provide an update and analysis of the progress schedule on a **weekly** basis, or as otherwise specified in the contract. Submission of the work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all work to comply with the requirements of the contract.

80-04 Limitation of operations. The Contractor shall control their operations and the operations of their subcontractors and all suppliers to provide for the free and unobstructed movement of aircraft in the air operations areas (AOA) of the airport.

When the work requires the Contractor to conduct their operations within an AOA of the airport, the work shall be coordinated with airport operations (through the RPR) at least 72 hours prior to commencement of such work. The Contractor shall not close an AOA until so authorized by the RPR and until the necessary temporary marking, signage and associated lighting is in place as provided in Section 70, paragraph 70-08, *Construction Safety and Phasing Plan (CSPP)*.

When the contract work requires the Contractor to work within an AOA of the airport on an intermittent basis (intermittent opening and closing of the AOA), the Contractor shall maintain constant communications as specified; immediately obey all instructions to vacate the AOA; and immediately obey all instructions to resume work in such AOA. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor's operations in the AOA until satisfactory conditions are provided. The areas of the AOA identified in the Construction Safety Phasing Plan (CSPP) that cannot be closed to operating aircraft to permit the Contractor's operations on a continuous basis and will therefore be closed to aircraft operations intermittently are as indicated in the CSPP.

The Contractor shall be required to conform to safety standards contained in AC 150/5370-2, Operational Safety on Airports During Construction and the approved CSPP.

80-04.1 Operational safety on airport during construction. All Contractors' operations shall be conducted in accordance with the approved project Construction Safety and Phasing Plan (CSPP) and the Safety Plan Compliance Document (SPCD) and the provisions set forth within the current version of AC 150/5370-2, Operational Safety on Airports During Construction. The CSPP included within the contract documents conveys minimum requirements for operational safety on the airport during construction activities. The Contractor shall prepare and submit a SPCD that details how it proposes to comply with the requirements presented within the CSPP.

The Contractor shall implement all necessary safety plan measures prior to commencement of any work activity. The Contractor shall conduct routine checks to assure compliance with the safety plan measures.

The Contractor is responsible to the Owner for the conduct of all subcontractors it employs on the project. The Contractor shall assure that all subcontractors are made aware of the requirements of the CSPP and SPCD and that they implement and maintain all necessary measures.

No deviation or modifications may be made to the approved CSPP and SPCD unless approved in writing by the Owner. The necessary coordination actions to review Contractor proposed modifications to an approved CSPP or approved SPCD can require a significant amount of time.

80-05 Character of workers, methods, and equipment. The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the contract, plans, and specifications.

All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.

Any person employed by the Contractor or by any subcontractor who violates any operational regulations or operational safety requirements and, in the opinion of the RPR, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the RPR, be removed

immediately by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without approval of the RPR.

Should the Contractor fail to remove such person or persons, or fail to furnish suitable and sufficient personnel for the proper execution of the work, the RPR may suspend the work by written notice until compliance with such orders.

All equipment that is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall not cause injury to previously completed work, adjacent property, or existing airport facilities due to its use.

When the methods and equipment to be used by the Contractor in accomplishing the work are not prescribed in the contract, the Contractor is free to use any methods or equipment that will accomplish the work in conformity with the requirements of the contract, plans, and specifications.

When the contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless otherwise authorized by the RPR. If the Contractor desires to use a method or type of equipment other than specified in the contract, the Contractor may request authority from the RPR to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the RPR determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the RPR may direct. No change will be made in basis of payment for the contract items involved nor in contract time as a result of authorizing a change in methods or equipment under this paragraph.

80-06 Temporary suspension of the work. The Owner shall have the authority to suspend the work wholly, or in part, for such period or periods the Owner may deem necessary, due to unsuitable weather, or other conditions considered unfavorable for the execution of the work, or for such time necessary due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the contract.

In the event that the Contractor is ordered by the Owner, in writing, to suspend work for some unforeseen cause not otherwise provided for in the contract and over which the Contractor has no control, the Contractor may be reimbursed for actual money expended on the work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the written order to suspend work to the effective date of the written order to resume the work. Claims for such compensation shall be filed with the RPR within the time period stated in the RPR's order to resume work. The Contractor shall submit with their own claim information substantiating the amount shown on the claim. The RPR will forward the Contractor's claim to the Owner for consideration in accordance with local laws or ordinances. No provision of this article shall be construed as entitling the Contractor to compensation for delays due to inclement weather or for any other delay provided for in the contract, plans, or specifications.

If it becomes necessary to suspend work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction nor become damaged in any way. The Contractor shall take every precaution to prevent damage or deterioration of the work performed and provide for normal drainage of the work. The Contractor shall erect temporary structures where necessary to provide for traffic on, to, or from the airport.

80-07 Determination and extension of contract time. The number of calendar shall be stated in the proposal and contract and shall be known as the Contract Time.

If the contract time requires extension for reasons beyond the Contractor's control, it shall be adjusted as follows:

80-07.1 Contract time based on calendar days. Contract Time based on calendar days shall consist of the number of calendar days stated in the contract counting from the effective date of the Notice to Proceed and including all Saturdays, Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of the Owner's orders to suspend and resume all work, due to causes not the fault of the Contractor, shall be excluded.

At the time of final payment, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in the contract time shall not consider either cost of work or the extension of contract time that has been covered by a change order or supplemental agreement. Charges against the contract time will cease as of the date of final acceptance.

80-08 Failure to complete on time. For each calendar day or working day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in paragraph 80-07, *Determination and Extension of Contract Time*) the sum specified in the contract and proposal as liquidated damages (LD) will be deducted from any money due or to become due the Contractor or their own surety. Such deducted sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages including but not limited to additional engineering services that will be incurred by the Owner should the Contractor fail to complete the work in the time provided in their contract.

See Project Specific Requirements for Airport Construction, Part 1 Technical Specifications SP-100 General Requirements for Airport Construction for Time Limitations and Liquidated Damages.

Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a wavier on the part of the Owner of any of its rights under the contract.

80-09 Default and termination of contract. The Contractor shall be considered in default of their contract and such default will be considered as cause for the Owner to terminate the contract for any of the following reasons, if the Contractor:

a. Fails to begin the work under the contract within the time specified in the Notice to Proceed, or

b. Fails to perform the work or fails to provide sufficient workers, equipment and/or materials to assure completion of work in accordance with the terms of the contract, or

c. Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, or

d. Discontinues the execution of the work, or

e. Fails to resume work which has been discontinued within a reasonable time after notice to do so, or

f. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or

g. Allows any final judgment to stand against the Contractor unsatisfied for a period of 10 days, or

h. Makes an assignment for the benefit of creditors, or

i. For any other cause whatsoever, fails to carry on the work in an acceptable manner.

Should the Owner consider the Contractor in default of the contract for any reason above, the Owner shall immediately give written notice to the Contractor and the Contractor's surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate the contract.

If the Contractor or surety, within a period of 10 days after such notice, does not proceed in accordance therewith, then the Owner will, upon written notification from the RPR of the facts of such delay, neglect, or default and the Contractor's failure to comply with such notice, have full power and authority without violating the contract, to take the execution of the work out of the hands of the Contractor. The Owner may appropriate or use any or all materials and equipment that have been mobilized for use in the work and are

acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof, or use such other methods as in the opinion of the RPR will be required for the completion of said contract in an acceptable manner.

All costs and charges incurred by the Owner, together with the cost of completing the work under contract, will be deducted from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be liable and shall pay to the Owner the amount of such excess.

80-10 Termination for national emergencies. The Owner shall terminate the contract or portion thereof by written notice when the Contractor is prevented from proceeding with the construction contract as a direct result of an Executive Order of the President with respect to the execution of war or in the interest of national defense.

When the contract, or any portion thereof, is terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract price or as mutually agreed for items of work partially completed or not started. No claims or loss of anticipated profits shall be considered.

Reimbursement for organization of the work, and other overhead expenses, (when not otherwise included in the contract) and moving equipment and materials to and from the job will be considered, the intent being that an equitable settlement will be made with the Contractor.

Acceptable materials, obtained or ordered by the Contractor for the work and that are not incorporated in the work shall, at the option of the Contractor, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designated by the RPR.

Termination of the contract or a portion thereof shall neither relieve the Contractor of their responsibilities for the completed work nor shall it relieve their surety of its obligation for and concerning any just claim arising out of the work performed.

80-11 Work area, storage area and sequence of operations. The Contractor shall obtain approval from the RPR prior to beginning any work in all areas of the airport. No operating runway, taxiway, or air operations area (AOA) shall be crossed, entered, or obstructed while it is operational. The Contractor shall plan and coordinate work in accordance with the approved CSPP and SPCD.

END OF SECTION 80

Section 90 Measurement and Payment

90-01 Measurement of quantities. All work completed under the contract will be measured by the RPR, or their authorized representatives, using United States Customary Units of Measurement**.**

The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 square feet (0.8 square meters) or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the RPR.

Unless otherwise specified, all contract items which are measured by the linear foot such as electrical ducts, conduits, pipe culverts, underdrains, and similar items shall be measured parallel to the base or foundation upon which such items are placed.

The term “lump sum” when used as an item of payment will mean complete payment for the work described in the contract. When a complete structure or structural unit (in effect, “lump sum” work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

When requested by the Contractor and approved by the RPR in writing, material specified to be measured by the cubic yard (cubic meter) may be weighed, and such weights will be converted to cubic yards (cubic meters) for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the RPR and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

Measurement and Payment Terms

Term	Description
Excavation and Embankment Volume	In computing volumes of excavation, the average end area method will be used unless otherwise specified.
Measurement and Proportion by Weight	The term “ton” will mean the short ton consisting of 2,000 pounds (907 km) avoirdupois. All materials that are measured or proportioned by weights shall be weighed on accurate, independently certified scales by competent, qualified personnel at locations designated by the RPR. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material is paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material being paid for by weight shall be weighed empty daily at such times as the RPR directs, and each truck shall bear a plainly legible identification mark.
Measurement by Volume	Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable for the materials hauled, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.

Term	Description
Asphalt Material	Asphalt materials will be measured by the gallon (liter) or ton (kg). When measured by volume, such volumes will be measured at 60°F (16°C) or will be corrected to the volume at 60°F (16°C) using ASTM D1250 for asphalts. Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when asphalt material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work. When asphalt materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, will be used for computing quantities.
Cement	Cement will be measured by the ton (kg) or hundredweight (km).
Structure	Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.
Timber	Timber will be measured by the thousand feet board measure (MFBM) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.
Plates and Sheets	The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inch.
Miscellaneous Items	When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gauge, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.
Scales	Scales must be tested for accuracy and serviced before use. Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end. Scales shall be accurate within 0.5% of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the RPR before beginning work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed 0.1% of the nominal rated capacity of the scale, but not less than one pound (454 grams). The use of spring balances will not be permitted. In the event inspection reveals the scales have been “overweighing” (indicating more than correct weight) they will be immediately adjusted. All materials received subsequent to the last previous correct weighting-accuracy test will be reduced by the percentage of error in excess of 0.5%. In the event inspection reveals the scales have been under-weighing (indicating less than correct weight), they shall be immediately adjusted. No additional payment to the Contractor will be allowed for materials previously weighed and recorded.

Term	Description
	Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the RPR can safely and conveniently view them. Scale installations shall have available ten standard 50-pound (2.3 km) weights for testing the weighing equipment or suitable weights and devices for other approved equipment. All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this subsection, for the weighing of materials for proportioning or payment, shall be included in the unit contract prices for the various items of the project.
Rental Equipment	Rental of equipment will be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the work. Special equipment ordered in connection with extra work will be measured as agreed in the change order or supplemental agreement authorizing such work as provided in paragraph 90-05 *Payment for Extra Work*.
Pay Quantities	When the estimated quantities for a specific portion of the work are designated as the pay quantities in the contract, they shall be the final quantities for which payment for such specific portion of the work will be made, unless the dimensions of said portions of the work shown on the plans are revised by the RPR. If revised dimensions result in an increase or decrease in the quantities of such work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

90-02 Scope of payment. The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials, for performing all work under the contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the execution thereof, subject to the provisions of Section 70, paragraph 70-18, *No Waiver of Legal Rights*.

When the “basis of payment” subsection of a technical specification requires that the contract price (price bid) include compensation for certain work or material essential to the item, this same work or material will not also be measured for payment under any other contract item which may appear elsewhere in the contract, plans, or specifications.

90-03 Compensation for altered quantities. When the accepted quantities of work vary from the quantities in the proposal, the Contractor shall accept as payment in full, so far as contract items are concerned, payment at the original contract price for the accepted quantities of work actually completed and accepted. No allowance, except as provided for in Section 40, paragraph 40-02, *Alteration of Work and Quantities,* will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from their own unbalanced allocation of overhead and profit among the contract items, or from any other cause.

90-04 Payment for omitted items. As specified in Section 40, paragraph 40-03, *Omitted Items,* the RPR shall have the right to omit from the work (order nonperformance) any contract item, except major contract items, in the best interest of the Owner.

Should the RPR omit or order nonperformance of a contract item or portion of such item from the work, the Contractor shall accept payment in full at the contract prices for any work actually completed and acceptable prior to the RPR’s order to omit or non-perform such contract item.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of the RPR’s order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the Owner.

In addition to the reimbursement hereinbefore provided, the Contractor shall be reimbursed for all actual costs incurred for the purpose of performing the omitted contract item prior to the date of the RPR's order. Such additional costs incurred by the Contractor must be directly related to the deleted contract item and shall be supported by certified statements by the Contractor as to the nature the amount of such costs.

90-05 Payment for extra work. Extra work, performed in accordance with Section 40, paragraph 40-04, *Extra Work*, will be paid for at the contract prices or agreed prices specified in the change order or supplemental agreement authorizing the extra work.

90-06 Partial payments. Partial payments will be made to the Contractor at least once each month as the work progresses. Said payments will be based upon estimates, prepared by the RPR, of the value of the work performed and materials complete and in place, in accordance with the contract, plans, and specifications. Such partial payments may also include the delivered actual cost of those materials stockpiled and stored in accordance with paragraph 90-07, *Payment for Materials on Hand*. No partial payment will be made when the amount due to the Contractor since the last estimate amounts to less than five hundred dollars.

a. From the total of the amount determined to be payable on a partial payment, 5% percent of such total amount will be deducted and retained by the Owner for protection of the Owner's interests. Unless otherwise instructed by the Owner, the amount retained by the Owner will be in effect until the final payment is made except as follows:

(1) Contractor may request release of retainage on work that has been partially accepted by the Owner in accordance with Section 50-14. Contractor must provide a certified invoice to the RPR that supports the value of retainage held by the Owner for partially accepted work.

(2) In lieu of retainage, the Contractor may exercise at its option the establishment of an escrow account per paragraph 90-08.

b. The Contractor is required to pay all subcontractors for satisfactory performance of their contracts no later than 30 days after the Contractor has received a partial payment. Contractor must provide the Owner evidence of prompt and full payment of retainage held by the prime Contractor to the subcontractor within 30 days after the subcontractor's work is satisfactorily completed. A subcontractor's work is satisfactorily completed when all the tasks called for in the subcontract have been accomplished and documented as required by the Owner. When the Owner has made an incremental acceptance of a portion of a prime contract, the work of a subcontractor covered by that acceptance is deemed to be satisfactorily completed.

c. When at least 95% of the work has been completed to the satisfaction of the RPR, the RPR shall, at the Owner's discretion and with the consent of the surety, prepare estimates of both the contract value and the cost of the remaining work to be done. The Owner may retain an amount not less than twice the contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

It is understood and agreed that the Contractor shall not be entitled to demand or receive partial payment based on quantities of work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the RPR to be a part of the final quantity for the item of work in question.

No partial payment shall bind the Owner to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in paragraph 90-09, *Acceptance and Final Payment*.

The Contractor shall deliver to the Owner a complete release of all claims for labor and material arising out of this contract before the final payment is made. If any subcontractor or supplier fails to furnish such a release in full, the Contractor may furnish a bond or other collateral satisfactory to the Owner to indemnify the Owner against any potential lien or other such claim. The bond or collateral shall include all costs, expenses, and attorney fees the Owner may be compelled to pay in discharging any such lien or claim.

90-07 Payment for materials on hand. Partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications and are delivered to acceptable sites on the airport property or at other sites in the vicinity that are acceptable to the Owner. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:

a. The material has been stored or stockpiled in a manner acceptable to the RPR at or on an approved site.

b. The Contractor has furnished the RPR with acceptable evidence of the quantity and quality of such stored or stockpiled materials.

c. The Contractor has furnished the RPR with satisfactory evidence that the material and transportation costs have been paid.

d. The Contractor has furnished the Owner legal title (free of liens or encumbrances of any kind) to the material stored or stockpiled.

e. The Contractor has furnished the Owner evidence that the material stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title and the Owner's payment for such stored or stockpiled materials shall in no way relieve the Contractor of their responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the contract price for such materials or the contract price for the contract item in which the material is intended to be used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this paragraph.

90-08 Payment of withheld funds. At the Contractor's option, if an Owner withholds retainage in accordance with the methods described in paragraph 90-06 *Partial Payments*, the Contractor may request that the Owner deposit the retainage into an escrow account. The Owner's deposit of retainage into an escrow account is subject to the following conditions:

a. The Contractor shall bear all expenses of establishing and maintaining an escrow account and escrow agreement acceptable to the Owner.

b. The Contractor shall deposit to and maintain in such escrow only those securities or bank certificates of deposit as are acceptable to the Owner and having a value not less than the retainage that would otherwise be withheld from partial payment.

c. The Contractor shall enter into an escrow agreement satisfactory to the Owner.

d. The Contractor shall obtain the written consent of the surety to such agreement.

90-09 Acceptance and final payment. When the contract work has been accepted in accordance with the requirements of Section 50, paragraph 50-15, *Final Acceptance*, the RPR will prepare the final estimate of the items of work actually performed. The Contractor shall approve the RPR's final estimate or advise the RPR of the Contractor's objections to the final estimate which are based on disputes in measurements or computations of the final quantities to be paid under the contract as amended by change order or supplemental agreement. The Contractor and the RPR shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within 30 calendar days of the Contractor's receipt of the RPR's final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the RPR's estimate under protest of the quantities in dispute, and such disputed quantities shall be considered by the Owner as a claim in accordance with Section 50, paragraph 50-16, *Claims for Adjustment and Disputes*.

After the Contractor has approved, or approved under protest, the RPR's final estimate, and after the RPR's receipt of the project closeout documentation required in paragraph 90-11, *Contractor Final Project Documentation*, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments and all amounts to be deducted under the provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

If the Contractor has filed a claim for additional compensation under the provisions of Section 50, paragraph 50-16, *Claims for Adjustments and Disputes,* or under the provisions of this paragraph, such claims will be considered by the Owner in accordance with local laws or ordinances. Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

90-10 Construction warranty.

a. In addition to any other warranties in this contract, the Contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, workmanship, or design furnished, or performed by the Contractor or any subcontractor or supplier at any tier.

b. This warranty shall continue for a period of one year from the date of final acceptance of the work, except as noted. If the Owner takes possession of any part of the work before final acceptance, this warranty shall continue for a period of one year from the date the Owner takes possession. However, this will not relieve the Contractor from corrective items required by the final acceptance of the project work. Light Emitting Diode emitting diode (LED) light fixtures with the exception of obstruction lighting, must be warranted by the manufacturer for a minimum of four (4) years after date of installation inclusive of all electronics.

c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Owner real or personal property, when that damage is the result of the Contractor's failure to conform to contract requirements; or any defect of equipment, material, workmanship, or design furnished by the Contractor.

d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for one year from the date of repair or replacement.

e. The Owner will notify the Contractor, in writing, within seven (7)days after the discovery of any failure, defect, or damage.

f. If the Contractor fails to remedy any failure, defect, or damage within 14 days after receipt of notice, the Owner shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall: (1) Obtain all warranties that would be given in normal commercial practice; (2) Require all warranties to be executed, in writing, for the benefit of the Owner, as directed by the Owner, and (3) Enforce all warranties for the benefit of the Owner.

h. This warranty shall not limit the Owner's rights with respect to latent defects, gross mistakes, or fraud.

90-11 Contractor Final Project Documentation. Approval of final payment to the Contractor is contingent upon completion and submittal of the items listed below. The final payment will not be approved until the RPR approves the Contractor's final submittal. The Contractor shall:

a. Provide two (2) copies of all manufacturers warranties specified for materials, equipment, and installations.

b. Provide weekly payroll records (not previously received) from the general Contractor and all subcontractors.

c. Complete final cleanup in accordance with Section 40, paragraph 40-08, *Final Cleanup*.

d. Complete all punch list items identified during the Final Inspection.

e. Provide complete release of all claims for labor and material arising out of the Contract.

f. Provide a certified statement signed by the subcontractors, indicating actual amounts paid to the Disadvantaged Business Enterprise (DBE) subcontractors and/or suppliers associated with the project.

g. When applicable per state requirements, return copies of sales tax completion forms.

h. Manufacturer's certifications for all items incorporated in the work.

i. All required record drawings, as-built drawings or as-constructed drawings.

j. Project Operation and Maintenance (O&M) Manual(s).

k. Security for Construction Warranty.

l. Equipment commissioning documentation submitted, if required.

m. SWPPP Notice of Termination files and approved by the State

n. Complete and consolidated materials testing and summary reports from CQCP.

END OF SECTION 90

PART 2

FAA General Construction Items

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Item C-100 Contractor Quality Control Program (CQCP)

100-1 General. Quality is more than test results. Quality is the combination of proper materials, testing, workmanship, equipment, inspection, and documentation of the project. Establishing and maintaining a culture of quality is key to achieving a quality project. The Contractor shall establish, provide, and maintain an effective Contractor Quality Control Program (CQCP) that details the methods and procedures that will be taken to assure that all materials and completed construction required by this contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified here and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose.

The Contractor shall establish a CQCP that will:

a. Provide qualified personnel to develop and implement the CQCP.

b. Provide for the production of acceptable quality materials.

c. Provide sufficient information to assure that the specification requirements can be met.

d. Document the CQCP process.

The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the CQCP has been reviewed and approved by the Resident Project Representative (RPR). No partial payment will be made for materials subject to specific quality control (QC) requirements until the CQCP has been reviewed and approved.

The QC requirements contained in this section and elsewhere in the contract technical specifications are in addition to and separate from the quality assurance (QA) testing requirements. QA testing requirements are the responsibility of the RPR or Contractor as specified in the specifications.

A Quality Control (QC)/Quality Assurance (QA) workshop with the Engineer, Resident Project Representative (RPR), Contractor, subcontractors, testing laboratories, and Owner's representative must be held prior to start of construction. The QC/QA workshop will be facilitated by the Contractor. The Contractor shall coordinate with the Airport and the RPR on time and location of the QC/QA workshop. Items to be addressed, at a minimum, will include:

a. Review of the CQCP including submittals, QC Testing, Action & Suspension Limits for Production, Corrective Action Plans, Distribution of QC reports, and Control Charts.

b. Discussion of the QA program.

c. Discussion of the QC and QA Organization and authority including coordination and information exchange between QC and QA.

d. Establish regular meetings to discuss control of materials, methods and testing.

e. Establishment of the overall QC culture.

100-2 Description of program.

a. General description. The Contractor shall establish a CQCP to perform QC inspection and testing of all items of work required by the technical specifications, including those performed by subcontractors. The CQCP shall ensure conformance to applicable specifications and plans with respect to materials, off-site fabrication, workmanship, construction, finish, and functional performance. The CQCP shall be effective for control of all construction work performed under this Contract and shall specifically include surveillance and tests required by the technical specifications, in addition to other requirements of this section and any other activities deemed necessary by the Contractor to establish an effective level of QC.

b. Contractor Quality Control Program (CQCP). The Contractor shall describe the CQCP in a written document that shall be reviewed and approved by the RPR prior to the start of any production, construction, or off-site fabrication. The written CQCP shall be submitted to the RPR for review and approval at least

10 calendar days before the CQCP Workshop. The Contractor's CQCP and QC testing laboratory must be approved in writing by the RPR prior to the Notice to Proceed (NTP).

The CQCP shall be organized to address, as a minimum, the following:

1. QC organization and resumes of key staff
2. Project progress schedule
3. Submittals schedule
4. Inspection requirements
5. QC testing plan
6. Documentation of QC activities and distribution of QC reports
7. Requirements for corrective action when QC and/or QA acceptance criteria are not met
8. Material quality and construction means and methods. Address all elements applicable to the project that affect the quality of the pavement structure including subgrade, subbase, base, and surface course. Some elements that must be addressed include, but is not limited to mix design, aggregate grading, stockpile management, mixing and transporting, placing and finishing, quality control testing and inspection, smoothness, laydown plan, equipment, and temperature management plan.

The Contractor must add any additional elements to the CQCP that is necessary to adequately control all production and/or construction processes required by this contract.

100-3 CQCP organization. The CQCP shall be implemented by the establishment of a QC organization. An organizational chart shall be developed to show all QC personnel, their authority, and how these personnel integrate with other management/production and construction functions and personnel.

The organizational chart shall identify all QC staff by name and function, and shall indicate the total staff required to implement all elements of the CQCP, including inspection and testing for each item of work. If necessary, different technicians can be used for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory is used for implementation of all or part of the CQCP, the personnel assigned shall be subject to the qualification requirements of paragraphs 100-03a and 100-03b. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.

The QC organization shall, as a minimum, consist of the following personnel:

a. Program Administrator. The Contractor Quality Control Program Administrator (CQCPA) must be a full-time employee of the Contractor, or a consultant engaged by the Contractor. The CQCPA must be available within two hours and be on-site during pavement construction activities. The CQCPA must have a minimum of five (5) years of experience in QC pavement construction with prior QC experience on a project of comparable size and scope as the contract.

Included in the five (5) years of paving/QC experience, the CQCPA must meet at least one of the following requirements:

(1) Professional Engineer with one (1) year of airport paving experience.

(2) Engineer-in-training with two (2) years of airport paving experience.

(3) National Institute for Certification in Engineering Technologies (NICET) Civil Engineering Technology Level IV with three (3) years of airport paving experience.

(4) An individual with four (4) years of airport paving experience, with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.

The CQCPA must have full authority to institute any and all actions necessary for the successful implementation of the CQCP to ensure compliance with the contract plans and technical specifications. The CQCPA authority must include the ability to immediately stop production until materials and/or processes

are in compliance with contract specifications. The CQCPA must report directly to a principal officer of the construction firm.

b. QC technicians. A sufficient number of QC technicians necessary to adequately implement the CQCP must be provided. These personnel must be either Engineers, engineering technicians, or experienced craftsman with qualifications in the appropriate field equivalent to NICET Level II in Civil Engineering Technology or higher, and shall have a minimum of two (2) years of experience in their area of expertise.

The QC technicians must report directly to the CQCPA and shall perform the following functions:

(1) Inspection of all materials, construction, plant, and equipment for conformance to the technical specifications, and as required by paragraph 100-6.

(2) Performance of all QC tests as required by the technical specifications and paragraph100-8.

(3) Performance of tests for the RPR when required by the technical specifications.

Certification at an equivalent level of qualification and experience by a state or nationally recognized organization will be acceptable in lieu of NICET certification.

c. Staffing levels. The Contractor shall provide sufficient qualified QC personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The CQCP shall state where different technicians will be required for different work elements.

100-4 Project progress schedule. Critical QC activities must be shown on the project schedule as required by Section 80, paragraph 80-03, *Execution and Progress*.

100-5 Submittals schedule. The Contractor shall submit a detailed listing of all submittals (for example, mix designs, material certifications) and shop drawings required by the technical specifications. The listing can be developed in a spreadsheet format and shall include as a minimum:

a. Specification item number

b. Item description

c. Description of submittal

d. Specification paragraph requiring submittal

e. Scheduled date of submittal

100-6 Inspection requirements. QC inspection functions shall be organized to provide inspections for all definable features of work, as detailed below. All inspections shall be documented by the Contractor as specified by paragraph 100-9.

Inspections shall be performed as needed to ensure continuing compliance with contract requirements until completion of the particular feature of work. Inspections shall include the following minimum requirements:

a. During plant operation for material production, QC test results and periodic inspections shall be used to ensure the quality of aggregates and other mix components, and to adjust and control mix proportioning to meet the approved mix design and other requirements of the technical specifications. All equipment used in proportioning and mixing shall be inspected to ensure its proper operating condition. The CQCP shall detail how these and other QC functions will be accomplished and used.

b. During field operations, QC test results and periodic inspections shall be used to ensure the quality of all materials and workmanship. All equipment used in placing, finishing, and compacting shall be inspected to ensure its proper operating condition and to ensure that all such operations are in conformance to the technical specifications and are within the plan dimensions, lines, grades, and tolerances specified. The CQCP shall document how these and other QC functions will be accomplished and used.

100-7 Contractor QC testing facility.

a. For projects that include Item P-401, Item P-403, and Item P-404, the Contractor shall ensure facilities, including all necessary equipment, materials, and current reference standards, are provided that meet requirements in the following paragraphs of ASTM D3666, *Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials*:

8.1.3 Equipment Calibration and Checks;

8.1.9 Equipment Calibration, Standardization, and Check Records;

8.1.12 Test Methods and Procedures

b. For projects that include P-501, the Contractor shall ensure facilities, including all necessary equipment, materials, and current reference standards, are provided that meet requirements in the following paragraphs of ASTM C1077, Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation:

7 Test Methods and Procedures

8 Facilities, Equipment, and Supplemental Procedures

100-8 QC testing plan. As a part of the overall CQCP, the Contractor shall implement a QC testing plan, as required by the technical specifications. The testing plan shall include the minimum tests and test frequencies required by each technical specification Item, as well as any additional QC tests that the Contractor deems necessary to adequately control production and/or construction processes.

The QC testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:

a. Specification item number (e.g., P-401)

b. Item description (e.g., Hot Mix Asphalt Pavements)

c. Test type (e.g., gradation, grade, asphalt content)

d. Test standard (e.g., ASTM or American Association of State Highway and Transportation Officials (AASHTO) test number, as applicable)

e. Test frequency (e.g., as required by technical specifications or minimum frequency when requirements are not stated)

f. Responsibility (e.g., plant technician)

g. Control requirements (e.g., target, permissible deviations)

The QC testing plan shall contain a statistically-based procedure of random sampling for acquiring test samples in accordance with ASTM D3665. The RPR shall be provided the opportunity to witness QC sampling and testing.

All QC test results shall be documented by the Contractor as required by paragraph 100-9.

100-9 Documentation. The Contractor shall maintain current QC records of all inspections and tests performed. These records shall include factual evidence that the required QC inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, etc.; proposed remedial action; and corrective actions taken.

These records must cover both conforming and defective or deficient features, and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. Legible copies of these records shall be furnished to the RPR daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the CQCPA.

Contractor QC records required for the contract shall include, but are not necessarily limited to, the following records:

a. Daily inspection reports. Each Contractor QC technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations. These technician's daily reports shall provide factual evidence that continuous QC inspections have been performed and shall, as a minimum, include the following:

(1) Technical specification item number and description

(2) Compliance with approved submittals

(3) Proper storage of materials and equipment

(4) Proper operation of all equipment

(5) Adherence to plans and technical specifications

(6) Summary of any necessary corrective actions

(7) Safety inspection.

(8) Photographs

The daily inspection reports shall identify all QC inspections and QC tests conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.

The daily inspection reports shall be signed by the responsible QC technician and the CQCPA. The RPR shall be provided at least one copy of each daily inspection report on the work day following the day of record. When QC inspection and test results are recorded and transmitted electronically, the results must be archived.

b. Daily test reports. The Contractor shall be responsible for establishing a system that will record all QC test results. Daily test reports shall document the following information:

(1) Technical specification item number and description

(2) Test designation

(3) Location

(4) Date of test

(5) Control requirements

(6) Test results

(7) Causes for rejection

(8) Recommended remedial actions

(9) Retests

Test results from each day's work period shall be submitted to the RPR prior to the start of the next day's work period. When required by the technical specifications, the Contractor shall maintain statistical QC charts. When QC daily test results are recorded and transmitted electronically, the results must be archived.

100-10 Corrective action requirements. The CQCP shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process into control. The requirements for corrective action shall include both general requirements for operation of the CQCP as a whole, and for individual items of work contained in the technical specifications.

The CQCP shall detail how the results of QC inspections and tests will be used for determining the need for corrective action and shall contain clear rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

When applicable or required by the technical specifications, the Contractor shall establish and use statistical QC charts for individual QC tests. The requirements for corrective action shall be linked to the control charts.

100-11 Inspection and/or observations by the RPR. All items of material and equipment are subject to inspection and/or observation by the RPR at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate QC system in conformance

with the requirements detailed here and the applicable technical specifications and plans. In addition, all items of materials, equipment and work in place shall be subject to inspection and/or observation by the RPR at the site for the same purpose.

Inspection and/or observations by the RPR does not relieve the Contractor of performing QC inspections of either on-site or off-site Contractor's or subcontractor's work.

100-12 Noncompliance.

a. The Resident Project Representative (RPR) will provide written notice to the Contractor of any noncompliance with their CQCP. After receipt of such notice, the Contractor must take corrective action.

b. When QC activities do not comply with either the CQCP or the contract provisions or when the Contractor fails to properly operate and maintain an effective CQCP, and no effective corrective actions have been taken after notification of non-compliance, the RPR will recommend the Owner take the following actions:

(1) Order the Contractor to replace ineffective or unqualified QC personnel or subcontractors and/or

(2) Order the Contractor to stop operations until appropriate corrective actions are taken.

METHOD OF MEASUREMENT

100-13 Basis of measurement. Contractor Quality Control Program (CQCP) will be paid as a lump sum with the following schedule of partial payments:

a. With first pay request, 25% with approval of CQCP and completion of the Quality Control (QC)/Quality Assurance (QA) workshop.
b. When 25% or more of the original contract is earned, an additional 25%.
c. When 50% or more of the original contract is earned, an additional 20%.
d. When 75% or more of the original contract is earned, an additional 20%.
e. After final inspection and acceptance of project as required by 90-11, the final 10%.

BASIS OF PAYMENT

100-14 Payment will be made under:

Item C-100-14.1 Contractor Quality Control Program (CQCP) –per lump sum

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

National Institute for Certification in Engineering Technologies (NICET)

ASTM International (ASTM)

ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

END OF ITEM C-100

Item C-102 Temporary Air and Water Pollution, Soil Erosion, and Siltation Control

DESCRIPTION

102-1. This item shall consist of temporary control measures as shown on the plans or as ordered by the Resident Project Representative (RPR) during the life of a contract to control pollution of air and water, soil erosion, and siltation through the use of silt fences, berms, dikes, dams, sediment basins, fiber mats, gravel, mulches, grasses, slope drains, and other erosion control devices or methods.

Temporary erosion control shall be in accordance with the approved erosion control plan; the approved Construction Safety and Phasing Plan (CSPP) and AC 150/5370-2, *Operational Safety on Airports During Construction*. The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.

Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites.

Temporary control measures shall be designed, installed and maintained to minimize the creation of wildlife attractants that have the potential to attract hazardous wildlife on or near public-use airports.

For Project Specific Requirements, refer to SP-102 Water Pollution Control, Erosion Control, and SWPPP Specification.

MATERIALS

102-2.1 Grass. Grass that will not compete with the grasses sown later for permanent cover per Item T-901 shall be a quick-growing species (such as ryegrass, Italian ryegrass, or cereal grasses) suitable to the area providing a temporary cover. Selected grass species shall not create a wildlife attractant.

102-2.2 Mulches. Not used.

102-2.3 Fertilizer. Fertilizer shall be a standard commercial grade and shall conform to all federal and state regulations and to the standards of the Association of Official Agricultural Chemists.

102-2.4 Slope drains. Not used.

102-2.5 Silt fence. Not used.

102-2.6 Other. All other materials shall meet commercial grade standards and shall be approved by the RPR before being incorporated into the project.

CONSTRUCTION REQUIREMENTS

102-3.1 General. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

The RPR shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.

A Storm Water Pollution Prevention Plan (SWPPP) and Notice of Intent (NOI) shall be developed and implemented by the Contractor. Any submittal fees associated with the SWPPP shall be borne by the Contractor.

The Contractor shall provide a QSP as a data submitter for the project to the SMARTS system.

102-3.2 Schedule. Prior to the start of construction, the Contractor shall submit schedules in accordance with the approved Construction Safety and Phasing Plan (CSPP) and the plans for accomplishment of temporary and permanent erosion control work for clearing and grubbing; grading; construction; paving; and structures at watercourses. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials. Work shall not be started until the erosion control schedules and methods of operation for the applicable construction have been accepted by the RPR.

102-3.3 Construction details. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the plans and approved CSPP. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices but are not associated with permanent control features on the project.

Where erosion may be a problem, schedule and perform clearing and grubbing operations so that grading operations and permanent erosion control features can follow immediately if project conditions permit. Temporary erosion control measures are required if permanent measures cannot immediately follow grading operations. The RPR shall limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current with the accepted schedule. If seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified as directed by the RPR.

The Contractor shall provide immediate permanent or temporary pollution control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment as directed by the RPR. If temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or directed by the RPR, the work shall be performed by the Contractor and the cost shall be incidental to this item.

The RPR may increase or decrease the area of erodible earth material that can be exposed at any time based on an analysis of project conditions.

The erosion control features installed by the Contractor shall be maintained by the Contractor during the construction period.

Provide temporary structures whenever construction equipment must cross watercourses at frequent intervals. Pollutants such as fuels, lubricants, bitumen, raw sewage, wash water from concrete mixing operations, and other harmful materials shall not be discharged into any waterways, impoundments or into natural or manmade channels.

102-3.4 Installation, maintenance and removal of silt fence. Not Used.

METHOD OF MEASUREMENT

102-4.1 Refer to SP-102 Water Pollution Control, Erosion Control, and SWPPP Specification.

BASIS OF PAYMENT

102-5.1 Refer to SP-102 Water Pollution Control, Erosion Control, and SWPPP Specification.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5200-33 *Hazardous Wildlife Attractants on or Near Airports*

AC 150/5370-2 *Operational Safety on Airports During Construction*

ASTM International (ASTM)

ASTM D6461 *Standard Specification for Silt Fence Materials*

United States Department of Agriculture (USDA)

FAA/USDA Wildlife Hazard Management at Airports, A Manual for Airport Personnel

END OF ITEM C-102

Item C-105 Mobilization

105-1 Description. This item of work shall consist of, but is not limited to, work and operations necessary for the movement of personnel, equipment, material and supplies to and from the project site for work on the project except as provided in the contract as separate pay items.

105-2 Mobilization limit. Mobilization shall be limited to 10 percent of the bid schedule in which it is listed.

105-3 Posted notices. Prior to commencement of construction activities, the Contractor must post the following documents in a prominent and accessible place where they may be easily viewed by all employees of the prime Contractor and by all employees of subcontractors engaged by the prime Contractor: Equal Employment Opportunity (EEO) Poster "Equal Employment Opportunity is the Law" in accordance with the Office of Federal Contract Compliance Programs Executive Order 11246, as amended; Davis Bacon Wage Poster (WH 1321) - DOL "Notice to All Employees" Poster; and Applicable Davis-Bacon Wage Rate Determination. These notices must remain posted until final acceptance of the work by the Owner.

105-4 Engineer/RPR field office. The Contractor shall provide dedicated space for the use of the field RPR and inspectors, as a field office for the duration of the project. This space shall be located conveniently near the construction and shall be separate from any space used by the Contractor. The Contractor shall furnish water, sanitary facilities, heat, air conditioning, and electricity in accordance with local building codes.

a. Field Office Requirements. Field offices shall consist of an RPR Approved mobile home, house-type trailers or houses or other approved types that are floored, roofed and weatherproofed. This facility shall meet the current State Highway Specifications for a Class II Field Office. The office space shall be equipped with suitable artificial lighting, furniture, and adequate heating/cooling equipment that will maintain a temperature range of 68-72°F during the hours of occupancy. An adequate supply of potable water for the RPR's use shall be provided and maintained at all times.

Provide and maintain suitable interior or exterior sanitary facilities complying with State and local health requirements in clean and good working condition, stocked with sanitary supplies for the duration of the Contract.

Include a first aid kit in each field office and field laboratory provided under the Contract. The kits shall be readily accessible to project personnel. The contents of each kit shall be checked at least once each week and expended items replenished as needed. Each kit shall contain, at a minimum, a supply of sterile latex gloves, CPR masks, adhesive tape, pressure and self-sticking bandages, antiseptic wipes, bite/sting swabs, cold packs, and safety goggles.

In situations where the eyes or body of a worker may be exposed to corrosive or potentially harmful materials, provide emergency use facilities capable of flushing the eyes or drenching the body of an exposed worker with water for 15 minutes.

The Contractor shall provide and be responsible for payment of Internet access for computers and equipment at the jobsite office location. The High Speed Internet connection shall have a minimum performance of 15 Mbps download speed and 5 Mbps upload speed and ping latency under 100ms, as tested from computers and equipment behind the firewall to https://www.speedtest.net/. Internet protection shall be provided with a current production, supported, and updated firewall configured with all outbound ports available. If not connected to a hardline internet connection, an individual "puck" internet connection must be provided meeting the upload and download speeds above shall be provided. The Contractor shall provide and maintain all wired and wireless connectivity to the Internet and between devices. A network capable color photocopier/printer (capabilities for up to 11" x 17" media for copying, scanning directly to email, and printing via Windows XP 32-bit, Windows 7 64-bit and Windows 10 64-bit computers) at no cost to the RPR shall be provided. The cost of these services shall be the responsibility of the Contractor.

Field Office shall have interior door(s) and padlock, windows equipped with adequate locks and screens, at least one outside door with required lock and screen, one suitability sized conference table with a minimum of four chairs, three suitable office desks with drawers and locks, three office chairs, and a 6-pound or larger fire extinguisher meeting the requirements for Classes A, B, and C of the NFPA code.

Field office, if not connected to public power, shall have a generator system capable of providing 48-hour service without being re-fueled. If the generator is not self-contained on a trailer or similar apparatus, and instead placed on the ground, it must be placed on a concrete platform no thinner than 4" and encompassing the entire body of the generator with 1 foot of excess material on the side.

The Contractor and the Contractor's superintendent shall provide all reasonable facilities to enable the Engineer to inspect the workmanship and materials used in the work. Failure by the Contractor to provide these amenities to the Engineer's onsite personnel will result in the delay of payment to the Contractor.

METHOD OF MEASUREMENT

105-5 Basis of measurement and payment. Based upon the contract lump sum price for "Mobilization" partial payments will be allowed as follows:

a. Upon acceptance of all submittals and establishment of the Resident Project Engineer's Field Office, 25%.

b. When 25% or more of the original contract is earned, an additional 25%.

c. When 50% or more of the original contract is earned, an additional 40%.

d. After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials as required by Section 90, paragraph 90-11, *Contractor Final Project Documentation,* the final 10%.

Mobilization will cover all items in this specification except the "Resident Project Engineer's Field Office."

Based upon the contract lump sum price for "Resident Project Engineer's Field Office" partial payments will be allowed as follows:

a. With first pay request, 25%.

b. When 25% or more of the original contract is earned, an additional 25%.

c. When 50% or more of the original contract is earned, an additional 40%.

d. After Final Inspection, staging area clean-up, and removal of the field-office, the final 10%.

BASIS OF PAYMENT

105-6 Payment will be made under:

Item C-105.1	Mobilization
Item C-105.2	Resident Project Engineer's Field Office

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Office of Federal Contract Compliance Programs (OFCCP)

Executive Order 11246, as amended

EEOC-P/E-1 – Equal Employment Opportunity is the Law Poster

United States Department of Labor, Wage and Hour Division (WHD)

WH 1321 – Employee Rights under the Davis-Bacon Act Poster

END OF ITEM C-105

Item C-110 Method of Estimating Percentage of Material Within Specification Limits (PWL)

110-1 General. When the specifications provide for acceptance of material based on the method of estimating percentage of material within specification limits (PWL), the PWL will be determined in accordance with this section. All test results for a lot will be analyzed statistically to determine the total estimated percent of the lot that is within specification limits. The PWL is computed using the sample average (X) and sample standard deviation (S_n) of the specified number (n) of sublots for the lot and the specification tolerance limits, L for lower and U for upper, for the particular acceptance parameter. From these values, the respective Quality index, Q_L for Lower Quality Index and/or Q_U for Upper Quality Index, is computed and the PWL for the lot for the specified n is determined from Table 1. All specification limits specified in the technical sections shall be absolute values. Test results used in the calculations shall be to the significant figure given in the test procedure.

There is some degree of uncertainty (risk) in the measurement for acceptance because only a small fraction of production material (the population) is sampled and tested. This uncertainty exists because all portions of the production material have the same probability to be randomly sampled. The Contractor's risk is the probability that material produced at the acceptable quality level is rejected or subjected to a pay adjustment. The Owner's risk is the probability that material produced at the rejectable quality level is accepted.

It is the intent of this section to inform the Contractor that, in order to consistently offset the Contractor's risk for material evaluated, production quality (using population average and population standard deviation) must be maintained at the acceptable quality specified or higher. In all cases, it is the responsibility of the Contractor to produce at quality levels that will meet the specified acceptance criteria when sampled and tested at the frequencies specified.

110-2 Method for computing PWL. The computational sequence for computing PWL is as follows:

a. Divide the lot into n sublots in accordance with the acceptance requirements of the specification.

b. Locate the random sampling position within the sublot in accordance with the requirements of the specification.

c. Make a measurement at each location or take a test portion and make the measurement on the test portion in accordance with the testing requirements of the specification.

d. Find the sample average (X) for all sublot test values within the lot by using the following formula:

$$\mathbf{X = (x_1 + x_2 + x_3 + \ldots x_n) / n}$$

Where: X = Sample average of all sublot test values within a lot

$x_1, x_2, \ldots x_n$ = Individual sublot test values

n = Number of sublot test values

e. Find the sample standard deviation (S_n) by use of the following formula:

$$\mathbf{S_n = [(d_1^2 + d_2^2 + d_3^2 + \ldots d_n^2)/(n-1)]^{1/2}}$$

Where: S_n = Sample standard deviation of the number of sublot test values in the set

$d_1, d_2, \ldots d_n$ = Deviations of the individual sublot test values $x_1, x_2, \ldots$ from the average value X

that is: $d_1 = (x_1 - X)$, $d_2 = (x_2 - X) \ldots d_n = (x_n - X)$

n = Number of sublot test values

f. For single sided specification limits (i.e., L only), compute the Lower Quality Index Q_L by use of the following formula:

$$\mathbf{Q_L = (X – L) / S_n}$$

Where: L = specification lower tolerance limit

Estimate the percentage of material within limits (PWL) by entering Table 1 with Q_L, using the column appropriate to the total number (n) of measurements. If the value of Q_L falls between values shown on the table, use the next higher value of PWL.

g. For double-sided specification limits (i.e., L and U), compute the Quality Indexes Q_L and Q_U by use of the following formulas:

$$\mathbf{Q_L = (X - L) / S_n}$$
$$\mathbf{and}$$
$$\mathbf{Q_U = (U - X) / S_n}$$

Where: L and U = specification lower and upper tolerance limits

Estimate the percentage of material between the lower (L) and upper (U) tolerance limits (PWL) by entering Table 1 separately with Q_L and Q_U, using the column appropriate to the total number (n) of measurements, and determining the percent of material above P_L and percent of material below P_U for each tolerance limit. If the values of Q_L fall between values shown on the table, use the next higher value of P_L or P_U. Determine the PWL by use of the following formula:

$$\mathbf{PWL = (P_U + P_L) - 100}$$

Where: P_L = percent within lower specification limit
P_U = percent within upper specification limit

EXAMPLE OF PWL CALCULATION

Project: Example Project

Test Item: Item P-401, Lot A.

A. PWL Determination for Mat Density.

1. Density of four random cores taken from Lot A.

   A-1 = 96.60
   A-2 = 97.55
   A-3 = 99.30
   A-4 = 98.35
   n = 4

2. Calculate average density for the lot.

   $X = (x_1 + x_2 + x_3 + . . . x_n) / n$
   $X = (96.60 + 97.55 + 99.30 + 98.35) / 4$
   X = 97.95% density

3. Calculate the standard deviation for the lot.

   $S_n = [((96.60 - 97.95)^2 + (97.55 - 97.95)^2 + (99.30 - 97.95)^2 + (98.35 - 97.95)^2)) / (4 - 1)]^{1/2}$
   $S_n = [(1.82 + 0.16 + 1.82 + 0.16) / 3]^{1/2}$

S_n = 1.15

4. Calculate the Lower Quality Index Q_L for the lot. (L=96.3)

   $Q_L = (X - L) / S_n$
   $Q_L = (97.95 - 96.30) / 1.15$
   $Q_L = 1.4348$

5. Determine PWL by entering Table 1 with Q_L= 1.44 and n= 4.

   PWL = 98

B. PWL Determination for Air Voids.

1. Air Voids of four random samples taken from Lot A.

   A-1 = 5.00
   A-2 = 3.74
   A-3 = 2.30
   A-4 = 3.25

2. Calculate the average air voids for the lot.

   $X = (x_1 + x_2 + x_3 \ldots n) / n$
   $X = (5.00 + 3.74 + 2.30 + 3.25) / 4$
   X = 3.57%

3. Calculate the standard deviation S_n for the lot.

   $S_n = [((3.57 - 5.00)^2 + (3.57 - 3.74)^2 + (3.57 - 2.30)^2 + (3.57 - 3.25)^2) / (4 - 1)]^{1/2}$
   $S_n = [(2.04 + 0.03 + 1.62 + 0.10) / 3]^{1/2}$
   S_n = 1.12

4. Calculate the Lower Quality Index Q_L for the lot. (L= 2.0)

   $Q_L = (X - L) / S_n$
   $Q_L = (3.57 - 2.00) / 1.12$
   $Q_L = 1.3992$

5. Determine P_L by entering Table 1 with Q_L = 1.41 and n = 4.

   P_L = 97

6. Calculate the Upper Quality Index Q_U for the lot. (U= 5.0)

   $Q_U = (U - X) / S_n$
   $Q_U = (5.00 - 3.57) / 1.12$
   $Q_U = 1.2702$

7. Determine P_U by entering Table 1 with Q_U = 1.29 and n = 4.

   P_U = 93

8. Calculate Air Voids PWL

   $PWL = (P_L + P_U) - 100$

   PWL = (97 + 93) - 100 = 90

EXAMPLE OF OUTLIER CALCULATION (REFERENCE ASTM E178)

Project: Example Project

Test Item: Item P-401, Lot A.

A. Outlier Determination for Mat Density.

1. Density of four random cores taken from Lot A arranged in descending order.

   A-3 = 99.30

   A-4 = 98.35

   A-2 = 97.55

   A-1 = 96.60

2. From ASTM E178, Table 1, for n=4 an upper 5% significance level, the critical value for test criterion = 1.463.

3. Use average density, standard deviation, and test criterion value to evaluate density measurements.

   a. For measurements greater than the average:

      If (measurement - average)/(standard deviation) is less than test criterion, then the measurement is not considered an outlier.

      For A-3, check if (99.30 - 97.95) / 1.15 is greater than 1.463.

      Since 1.174 is less than 1.463, the value is not an outlier.

   b. For measurements less than the average:

      If (average - measurement)/(standard deviation) is less than test criterion, then the measurement is not considered an outlier.

      For A-1, check if (97.95 - 96.60) / 1.15 is greater than 1.463.

      Since 1.435 is less than 1.463, the value is not an outlier.

Note: In this example, a measurement would be considered an outlier if the density were:

Greater than (97.95 + 1.463 × 1.15) = 99.63%

OR

less than (97.95 - 1.463 × 1.15) = 96.27%.

Table 1. Table for Estimating Percent of Lot Within Limits (PWL)

Percent Within Limits (P_L and P_U)	Positive Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
99	1.1541	1.4700	1.6714	1.8008	1.8888	1.9520	1.9994	2.0362
98	1.1524	1.4400	1.6016	1.6982	1.7612	1.8053	1.8379	1.8630
97	1.1496	1.4100	1.5427	1.6181	1.6661	1.6993	1.7235	1.7420
96	1.1456	1.3800	1.4897	1.5497	1.5871	1.6127	1.6313	1.6454
95	1.1405	1.3500	1.4407	1.4887	1.5181	1.5381	1.5525	1.5635
94	1.1342	1.3200	1.3946	1.4329	1.4561	1.4717	1.4829	1.4914
93	1.1269	1.2900	1.3508	1.3810	1.3991	1.4112	1.4199	1.4265
92	1.1184	1.2600	1.3088	1.3323	1.3461	1.3554	1.3620	1.3670
91	1.1089	1.2300	1.2683	1.2860	1.2964	1.3032	1.3081	1.3118
90	1.0982	1.2000	1.2290	1.2419	1.2492	1.2541	1.2576	1.2602
89	1.0864	1.1700	1.1909	1.1995	1.2043	1.2075	1.2098	1.2115
88	1.0736	1.1400	1.1537	1.1587	1.1613	1.1630	1.1643	1.1653
87	1.0597	1.1100	1.1173	1.1192	1.1199	1.1204	1.1208	1.1212
86	1.0448	1.0800	1.0817	1.0808	1.0800	1.0794	1.0791	1.0789
85	1.0288	1.0500	1.0467	1.0435	1.0413	1.0399	1.0389	1.0382
84	1.0119	1.0200	1.0124	1.0071	1.0037	1.0015	1.0000	0.9990
83	0.9939	0.9900	0.9785	0.9715	0.9671	0.9643	0.9624	0.9610
82	0.9749	0.9600	0.9452	0.9367	0.9315	0.9281	0.9258	0.9241
81	0.9550	0.9300	0.9123	0.9025	0.8966	0.8928	0.8901	0.8882
80	0.9342	0.9000	0.8799	0.8690	0.8625	0.8583	0.8554	0.8533
79	0.9124	0.8700	0.8478	0.8360	0.8291	0.8245	0.8214	0.8192
78	0.8897	0.8400	0.8160	0.8036	0.7962	0.7915	0.7882	0.7858
77	0.8662	0.8100	0.7846	0.7716	0.7640	0.7590	0.7556	0.7531
76	0.8417	0.7800	0.7535	0.7401	0.7322	0.7271	0.7236	0.7211
75	0.8165	0.7500	0.7226	0.7089	0.7009	0.6958	0.6922	0.6896
74	0.7904	0.7200	0.6921	0.6781	0.6701	0.6649	0.6613	0.6587
73	0.7636	0.6900	0.6617	0.6477	0.6396	0.6344	0.6308	0.6282
72	0.7360	0.6600	0.6316	0.6176	0.6095	0.6044	0.6008	0.5982
71	0.7077	0.6300	0.6016	0.5878	0.5798	0.5747	0.5712	0.5686
70	0.6787	0.6000	0.5719	0.5582	0.5504	0.5454	0.5419	0.5394
69	0.6490	0.5700	0.5423	0.5290	0.5213	0.5164	0.5130	0.5105
68	0.6187	0.5400	0.5129	0.4999	0.4924	0.4877	0.4844	0.4820
67	0.5878	0.5100	0.4836	0.4710	0.4638	0.4592	0.4560	0.4537
66	0.5563	0.4800	0.4545	0.4424	0.4355	0.4310	0.4280	0.4257
65	0.5242	0.4500	0.4255	0.4139	0.4073	0.4030	0.4001	0.3980
64	0.4916	0.4200	0.3967	0.3856	0.3793	0.3753	0.3725	0.3705
63	0.4586	0.3900	0.3679	0.3575	0.3515	0.3477	0.3451	0.3432
62	0.4251	0.3600	0.3392	0.3295	0.3239	0.3203	0.3179	0.3161
61	0.3911	0.3300	0.3107	0.3016	0.2964	0.2931	0.2908	0.2892
60	0.3568	0.3000	0.2822	0.2738	0.2691	0.2660	0.2639	0.2624
59	0.3222	0.2700	0.2537	0.2461	0.2418	0.2391	0.2372	0.2358
58	0.2872	0.2400	0.2254	0.2186	0.2147	0.2122	0.2105	0.2093
57	0.2519	0.2100	0.1971	0.1911	0.1877	0.1855	0.1840	0.1829
56	0.2164	0.1800	0.1688	0.1636	0.1607	0.1588	0.1575	0.1566
55	0.1806	0.1500	0.1406	0.1363	0.1338	0.1322	0.1312	0.1304
54	0.1447	0.1200	0.1125	0.1090	0.1070	0.1057	0.1049	0.1042
53	0.1087	0.0900	0.0843	0.0817	0.0802	0.0793	0.0786	0.0781
52	0.0725	0.0600	0.0562	0.0544	0.0534	0.0528	0.0524	0.0521
51	0.0363	0.0300	0.0281	0.0272	0.0267	0.0264	0.0262	0.0260
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Percent Within Limits (P_L and P_U)	Negative Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
49	-0.0363	-0.0300	-0.0281	-0.0272	-0.0267	-0.0264	-0.0262	-0.0260
48	-0.0725	-0.0600	-0.0562	-0.0544	-0.0534	-0.0528	-0.0524	-0.0521
47	-0.1087	-0.0900	-0.0843	-0.0817	-0.0802	-0.0793	-0.0786	-0.0781
46	-0.1447	-0.1200	-0.1125	-0.1090	-0.1070	-0.1057	-0.1049	-0.1042
45	-0.1806	-0.1500	-0.1406	-0.1363	-0.1338	-0.1322	-0.1312	-0.1304
44	-0.2164	-0.1800	-0.1688	-0.1636	-0.1607	-0.1588	-0.1575	-0.1566
43	-0.2519	-0.2100	-0.1971	-0.1911	-0.1877	-0.1855	-0.1840	-0.1829
42	-0.2872	-0.2400	-0.2254	-0.2186	-0.2147	-0.2122	-0.2105	-0.2093
41	-0.3222	-0.2700	-0.2537	-0.2461	-0.2418	-0.2391	-0.2372	-0.2358
40	-0.3568	-0.3000	-0.2822	-0.2738	-0.2691	-0.2660	-0.2639	-0.2624
39	-0.3911	-0.3300	-0.3107	-0.3016	-0.2964	-0.2931	-0.2908	-0.2892
38	-0.4251	-0.3600	-0.3392	-0.3295	-0.3239	-0.3203	-0.3179	-0.3161
37	-0.4586	-0.3900	-0.3679	-0.3575	-0.3515	-0.3477	-0.3451	-0.3432
36	-0.4916	-0.4200	-0.3967	-0.3856	-0.3793	-0.3753	-0.3725	-0.3705
35	-0.5242	-0.4500	-0.4255	-0.4139	-0.4073	-0.4030	-0.4001	-0.3980
34	-0.5563	-0.4800	-0.4545	-0.4424	-0.4355	-0.4310	-0.4280	-0.4257
33	-0.5878	-0.5100	-0.4836	-0.4710	-0.4638	-0.4592	-0.4560	-0.4537
32	-0.6187	-0.5400	-0.5129	-0.4999	-0.4924	-0.4877	-0.4844	-0.4820
31	-0.6490	-0.5700	-0.5423	-0.5290	-0.5213	-0.5164	-0.5130	-0.5105
30	-0.6787	-0.6000	-0.5719	-0.5582	-0.5504	-0.5454	-0.5419	-0.5394
29	-0.7077	-0.6300	-0.6016	-0.5878	-0.5798	-0.5747	-0.5712	-0.5686
28	-0.7360	-0.6600	-0.6316	-0.6176	-0.6095	-0.6044	-0.6008	-0.5982
27	-0.7636	-0.6900	-0.6617	-0.6477	-0.6396	-0.6344	-0.6308	-0.6282
26	-0.7904	-0.7200	-0.6921	-0.6781	-0.6701	-0.6649	-0.6613	-0.6587
25	-0.8165	-0.7500	-0.7226	-0.7089	-0.7009	-0.6958	-0.6922	-0.6896
24	-0.8417	-0.7800	-0.7535	-0.7401	-0.7322	-0.7271	-0.7236	-0.7211
23	-0.8662	-0.8100	-0.7846	-0.7716	-0.7640	-0.7590	-0.7556	-0.7531
22	-0.8897	-0.8400	-0.8160	-0.8036	-0.7962	-0.7915	-0.7882	-0.7858
21	-0.9124	-0.8700	-0.8478	-0.8360	-0.8291	-0.8245	-0.8214	-0.8192
20	-0.9342	-0.9000	-0.8799	-0.8690	-0.8625	-0.8583	-0.8554	-0.8533
19	-0.9550	-0.9300	-0.9123	-0.9025	-0.8966	-0.8928	-0.8901	-0.8882
18	-0.9749	-0.9600	-0.9452	-0.9367	-0.9315	-0.9281	-0.9258	-0.9241
17	-0.9939	-0.9900	-0.9785	-0.9715	-0.9671	-0.9643	-0.9624	-0.9610
16	-1.0119	-1.0200	-1.0124	-1.0071	-1.0037	-1.0015	-1.0000	-0.9990
15	-1.0288	-1.0500	-1.0467	-1.0435	-1.0413	-1.0399	-1.0389	-1.0382
14	-1.0448	-1.0800	-1.0817	-1.0808	-1.0800	-1.0794	-1.0791	-1.0789
13	-1.0597	-1.1100	-1.1173	-1.1192	-1.1199	-1.1204	-1.1208	-1.1212
12	-1.0736	-1.1400	-1.1537	-1.1587	-1.1613	-1.1630	-1.1643	-1.1653
11	-1.0864	-1.1700	-1.1909	-1.1995	-1.2043	-1.2075	-1.2098	-1.2115
10	-1.0982	-1.2000	-1.2290	-1.2419	-1.2492	-1.2541	-1.2576	-1.2602
9	-1.1089	-1.2300	-1.2683	-1.2860	-1.2964	-1.3032	-1.3081	-1.3118
8	-1.1184	-1.2600	-1.3088	-1.3323	-1.3461	-1.3554	-1.3620	-1.3670
7	-1.1269	-1.2900	-1.3508	-1.3810	-1.3991	-1.4112	-1.4199	-1.4265
6	-1.1342	-1.3200	-1.3946	-1.4329	-1.4561	-1.4717	-1.4829	-1.4914
5	-1.1405	-1.3500	-1.4407	-1.4887	-1.5181	-1.5381	-1.5525	-1.5635
4	-1.1456	-1.3800	-1.4897	-1.5497	-1.5871	-1.6127	-1.6313	-1.6454
3	-1.1496	-1.4100	-1.5427	-1.6181	-1.6661	-1.6993	-1.7235	-1.7420
2	-1.1524	-1.4400	-1.6016	-1.6982	-1.7612	-1.8053	-1.8379	-1.8630
1	-1.1541	-1.4700	-1.6714	-1.8008	-1.8888	-1.9520	-1.9994	-2.0362

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM E178 Standard Practice for Dealing with Outlying Observations

END OF ITEM C-110

PARTS 3-13

FAA Technical Specifications

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Item P-101 Preparation/Removal of Existing Pavements

DESCRIPTION

101-1 This item shall consist of preparation of existing pavement surfaces for overlay, surface treatments, removal of existing pavement, and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable plans.

EQUIPMENT AND MATERIALS

101-2 All equipment and materials shall be specified here and in the following paragraphs or approved by the Resident Project Representative (RPR). The equipment shall not cause damage to the pavement to remain in place.

CONSTRUCTION

101-3.1 Removal of existing pavement.

The Contractor's removal operation shall be controlled to not damage adjacent pavement structure, and base material, cables, utility ducts, pipelines, or drainage structures which are to remain under the pavement.

a. Concrete pavement removal. Not Used

b. Asphalt pavement removal. Asphalt pavement to be removed shall be cut to the full depth of the asphalt pavement around the perimeter of the area to be removed. If the material is to be wasted on the airport site and/or incorporated into embankment, it shall be broken to a maximum size of 2 inches. Some of the material shall be placed on the contractor staging area as specified in SP-100 and/or used to mix with the existing subgrade.

c. Repair or removal of Base, Subbase, and/or Subgrade. All failed material including surface, base course, subbase course, and subgrade shall be removed and repaired as shown on the plans or as directed by the RPR. Materials and methods of construction shall comply with the applicable sections of these specifications. Any damage caused by Contractor's removal process shall be repaired at the Contractor's expense.

101-3.2 Preparation of joints and cracks prior to overlay/surface treatment. Remove all vegetation and debris from cracks to a minimum depth of 1 inch. If extensive vegetation exists, treat the specific area with a concentrated solution of a water-based herbicide approved by the RPR. Fill all cracks greater than 1/4 inch wide) with a crack sealant per ASTM D6690. The crack sealant, preparation, and application shall be compatible with the surface treatment/overlay to be used. To minimize contamination of the asphalt with the crack sealant, underfill the crack sealant a minimum of 1/8 inch, not to exceed ¼ inch. Any excess joint or crack sealer shall be removed from the pavement surface.

Wider cracks (over 1-1/2 inch wide), along with soft or sunken spots, indicate that the pavement or the pavement base should be repaired or replaced as stated below.

Cracks and joints may be filled with a mixture of emulsified asphalt and aggregate. The aggregate shall consist of limestone, volcanic ash, sand, or other material that will cure to form a hard substance. The combined gradation shall be as shown in the following table.

Gradation

Sieve Size	Percent Passing
No. 4	100
No. 8	90-100
No. 16	65-90
No. 30	40-60
No. 50	25-42
No. 100	15-30
No. 200	10-20

Up to 3% cement can be added to accelerate the set time. The mixture shall not contain more than 20% natural sand without approval in writing from the RPR.

The proportions of asphalt emulsion and aggregate shall be determined in the field and may be varied to facilitate construction requirements. Normally, these proportions will be approximately one part asphalt emulsion to five parts aggregate by volume. The material shall be poured or placed into the joints or cracks and compacted to form a voidless mass. The joint or crack shall be filled to within +0 to -1/8 inches of the surface. Any material spilled outside the width of the joint shall be removed from the pavement surface prior to constructing the overlay. Where concrete overlays are to be constructed, only the excess joint material on the pavement surface and vegetation in the joints need to be removed.

101-3.3 Removal of Foreign Substances/contaminates prior to overlay, seal-coat, or remarking. Removal of foreign substances/contaminates from existing pavement that will affect the bond of the new treatment shall consist of removal of rubber, fuel spills, oil, crack sealer, at least 90% of paint, and other foreign substances from the surface of the pavement. Areas that require removal are designated on the plans and as directed by the RPR in the field during construction.

High-pressure water or cold milling may be used. Removal methods used shall not cause major damage to the pavement, or to any structure or utility within or adjacent to the work area. Major damage is defined as changing the properties of the pavement, removal of asphalt causing the aggregate to ravel, or removing pavement over 1/8 inch deep. If it is deemed by the RPR that damage to the existing pavement is caused by operational error, such as permitting the application method to dwell in one location for too long, the Contractor shall repair the damaged area without compensation and as directed by the RPR.

Removal of foreign substances shall not proceed until approved by the RPR. Water used for high-pressure water equipment shall be provided by the Contractor at the Contractor's expense. No material shall be deposited on the pavement shoulders. All wastes shall be disposed of in areas indicated in this specification or shown on the plans.

101-3.4 Concrete spall or failed asphaltic concrete pavement repair.

a. Repair of concrete spalls in areas to be overlaid with asphalt. Not used.

b. Asphalt pavement repair. Not used.

101-3.5 Cold milling. Milling shall be performed with a power-operated milling machine or grinder, capable of producing a uniform finished surface. The milling machine or grinder shall operate without tearing or gouging the underlaying surface. The milling machine or grinder shall be equipped with grade and slope controls, and a positive means of dust control. All millings shall be removed and disposed of off Airport property. If the Contractor mills or grinds deeper or wider than the plans specify, the Contractor shall replace the material removed with new material at the Contractor’s Expense.

a. Patching. The milling machine shall be capable of cutting a vertical edge without chipping or spalling the edges of the remaining pavement and it shall have a positive method of controlling the depth of cut.

The RPR shall layout the area to be milled with a straightedge in increments of 1-foot widths. The area to be milled shall cover only the failed area. Any excessive area that is milled because the Contractor doesn't have the appropriate milling machine, or areas that are damaged because of his negligence, shall be repaired by the Contractor at the Contractor's Expense.

b. Profiling, grade correction, or surface correction. The milling machine shall have a minimum width of 7 feet and it shall be equipped with electronic grade control devices that will cut the surface to the grade specified. The tolerances shall be maintained within +0 inch and -1/4 inch of the specified grade. The machine must cut vertical edges and have a positive method of dust control. The machine must have the ability to remove the millings or cuttings from the pavement and load them into a truck. All millings shall be removed and disposed of off the airport**.**

c. Clean-up. The Contractor shall sweep the milled surface daily and immediately after the milling until all residual materials are removed from the pavement surface. Prior to paving, the Contractor shall wet down the milled pavement and thoroughly sweep and/or blow the surface to remove loose residual material. Waste materials shall be collected and removed from the pavement surface and adjacent areas by sweeping or vacuuming. Waste materials shall be removed and disposed of off Airport property.

101-3.6. Preparation of asphalt pavement surfaces prior to surface treatment. Existing asphalt pavements to be treated with a surface treatment shall be prepared as follows:

a. Patch asphalt pavement surfaces that have been softened by petroleum derivatives or have failed due to any other cause. Remove damaged pavement to the full depth of the damage and replace with new asphalt pavement similar to that of the existing pavement in accordance with paragraph 101-3.4b.

b. Repair joints and cracks in accordance with paragraph 101-3.2.

c. Remove oil or grease that has not penetrated the asphalt pavement by scrubbing with a detergent and washing thoroughly with clean water. After cleaning, treat these areas with an oil spot primer.

d. Clean pavement surface immediately prior to placing the surface treatment so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film.

101-3.7 Maintenance. The Contractor shall perform all maintenance work necessary to keep the pavement in a satisfactory condition until the full section is complete and accepted by the RPR. The surface shall be kept clean and free from foreign material. The pavement shall be properly drained at all times. If cleaning is necessary or if the pavement becomes disturbed, any work repairs necessary shall be performed at the Contractor's expense.

101-3.8 Preparation of Joints in Rigid Pavement prior to resealing. Not used.

101-3.8.1 Removal of Existing Joint Sealant. Not used.

101-3.8.2 Cleaning prior to sealing. Not used.

101-3.8.3 Joint sealant. Not used.

101-3.9 Preparation of Cracks in Flexible Pavement prior to sealing. Prior to application of sealant material, clean and dry the joints of all scale, dirt, dust, old sealant, curing compound, moisture and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method used cleans the cracks and does not damage the pavement.

101-3.9.1 Preparation of Crack. Widen crack with router by removing a minimum of 1/16 inch from each side of crack. Immediately before sealing, cracks will be blown out with a hot air lance combined with oil and water-free compressed air.

101-3.9.2 Removal of Existing Crack Sealant. Existing sealants will be removed by routing. Following routing any remaining debris will be removed by use of a hot lance combined with oil and water-free compressed air.

101-3.9.3 Crack Sealant. Crack sealant material and installation will be in accordance with Item P-605 .

101-3.9.4 Removal of Pipe and other Buried Structures.

a. Removal of Existing Pipe Material. Remove the types of pipe as indicated on the plans. The pipe material shall be legally disposed of off-site in a timely manner following removal. Trenches shall be backfilled with material equal to or better in quality than adjacent final embankment. Trenches under paved areas must be compacted to the requirements of the pavement section and P-152.

b. Removal of Inlets/Manholes. Where indicated on the plans or as directed by the RPR, inlets and/or manholes shall be removed and legally disposed of off-site in a timely fashion after removal. Excavations after removal shall be backfilled with material equal or better in quality than adjacent proposed embankment. When under paved areas must be compacted to the requirements of the paving section, when outside of paved areas must be compacted to adjacent proposed embankment.

METHOD OF MEASUREMENT

101-4.1 Full-depth Asphalt Pavement Removal. The unit of measurement for pavement removal shall be the number of square yards removed by the Contractor. Any pavement removed outside the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment. If pavement thickness is within 1/2-inch tolerance of what the Geotechnical Report maximum core thickness indicates, Contractor will not be entitled to additional funds. No direct measurement or payment shall be made for saw cutting, onsite or offsite hauling, and disposal. Saw cutting shall be incidental to pavement removal.

101-4.2 Crack repair. The unit of measurement for crack repair shall be the linear foot or square foot as indicated below.

101-4.3 Removal of Airfield Marking. The unit of measurement for foreign Substances/contaminates removal shall be the square foot.

101-4.4 Not Used

101-4.5 Not Used

101-4.6 Cold milling. The unit of measure for cold milling shall be 2 inches maximum of milling per square yard. The location and average depth of the cold milling shall be as shown on the plans. If the initial cut does not correct the condition, the Contractor shall re-mill the area and will be paid for the total depth of milling.

101-4.7 Removal of Pipe and other Buried Structures. The unit of measurement for removal of pipe and other buried structures will be made at the contract unit price for linear foot completed and accepted. This price shall be full compensation for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with paragraph 101-3.9.4.

BASIS OF PAYMENT

101-5.1 Payment. Payment shall be made at contract unit price for the unit of measurement as specified above. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and disposal of the material and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item P 101-5.1 Demolish Asphalt Pavement – per square yard

Item P-101-5.2	Asphalt Crack Repair (under 1.5" width) – per linear foot
Item P-101-5.3	Asphalt Crack Repair (over 1.5" width) – per square foot
Item P-101-5.4	Remove Pavement Markings – per square foot
Item P-101-5.6	Cold Mill, Variable Depth (2 inches Maximum) – per square yard
Item P-101-5.7a	Demolish Storm Drain Pipe – per linear foot
Item P-101-5.7b	Demolish Catch Basin / Inlet – per each

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5380-6	Guidelines and Procedures for Maintenance of Airport Pavements.

ASTM International (ASTM)

ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

END OF ITEM P-101

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Item P-151 Clearing and Grubbing

DESCRIPTION

151-1.1 This item shall consist of clearing or clearing and grubbing, including the disposal of materials, for all areas within the limits designated on the plans or as required by the Resident Project Representative (RPR).

a. Clearing. Not used.

b. Clearing and grubbing shall consist of clearing the surface of the ground of the designated areas of all trees, stumps, down timber, logs, snags, brush, undergrowth, hedges, heavy growth of grass or weeds, fences, structures, debris, and rubbish of any nature, natural obstructions or such material which in the opinion of the RPR is unsuitable for the foundation of strips, pavements, or other required structures, including the grubbing of stumps, roots, matted roots, foundations, and the disposal from the project of all spoil materials resulting from clearing and grubbing.

CONSTRUCTION METHODS

151-2.1 General. The areas denoted on the plans to be cleared and grubbed shall be staked on the ground by the Contractor as indicated on the plans.

The removal of existing structures and utilities required to permit orderly progress of work shall be accomplished by local agencies, unless otherwise shown on the plans. Whenever a telephone pole, pipeline, conduit, sewer, roadway, or other utility is encountered and must be removed or relocated, the Contractor shall advise the RPR who will notify the proper local authority or owner to secure prompt action.

151-2.1.1 Disposal. All materials removed by clearing or by clearing and grubbing shall be disposed of outside the Airport's limits at the Contractor's responsibility, except when otherwise directed by the RPR. As far as practicable, waste concrete and masonry shall be placed on slopes of embankments or channels. When embankments are constructed of such material, this material shall be placed in accordance with requirements for formation of embankments. Any broken concrete or masonry that cannot be used in construction and all other materials not considered suitable for use elsewhere, shall be disposed of by the Contractor. In no case, shall any discarded materials be left in windrows or piles adjacent to or within the airport limits. The manner and location of disposal of materials shall be subject to the approval of the RPR and shall not create an unsightly or objectionable view. When the Contractor is required to locate a disposal area outside the airport property limits, the Contractor shall obtain and file with the RPR permission in writing from the property owner for the use of private property for this purpose.

151-2.1.2 Blasting. Blasting shall not be allowed.

151-2.2 Clearing. The Contractor shall clear the staked or indicated area of all materials as indicated on the plans. Trees unavoidably falling outside the specified clearing limits must be cut up, removed, and disposed of in a satisfactory manner. To minimize damage to trees that are to be left standing, trees shall be felled toward the center of the area being cleared. The Contractor shall preserve and protect from injury all trees not to be removed. The trees, stumps, and brush shall be cut flush with the original ground surface. The grubbing of stumps and roots will not be required.

Fences shall be removed and disposed of as directed by the RPR. Fence wire shall be neatly rolled and the wire and posts stored on the airport if they are to be used again, or stored at a location designated by the RPR if the fence is to remain the property of a local owner or authority.

151-2.3 Clearing and grubbing. In areas designated to be cleared and grubbed, all stumps, roots, buried logs, brush, grass, and other unsatisfactory materials as indicated on the plans, shall be removed, except where embankments exceeding 3-1/2 feet in depth will be constructed outside of paved areas. For embankments constructed outside of paved areas, all unsatisfactory materials shall be removed, but sound trees, stumps, and brush can be cut off flush with the original ground and allowed to remain. Tap roots and

other projections over 1-1/2 inches (diameter shall be grubbed out to a depth of at least 18 inches below the finished subgrade or slope elevation.

Any buildings and miscellaneous structures that are shown on the plans to be removed shall be demolished or removed, and all materials shall be disposed of by removal from the site. The cost of removal is incidental to this item. The remaining or existing foundations, wells, cesspools, and like structures shall be destroyed by breaking down the materials of which the foundations, wells, cesspools, etc., are built to a depth at least 2 feet below the existing surrounding ground. Any broken concrete, blocks, or other objectionable material that cannot be used in backfill shall be removed and disposed of at the Contractor's expense. The holes or openings shall be backfilled with acceptable material and properly compacted.

All holes in embankment areas remaining after the grubbing operation shall have the sides of the holes flattened to facilitate filling with acceptable material and compacting as required in Item P-152. The same procedure shall be applied to all holes remaining after grubbing in areas where the depth of holes exceeds the depth of the proposed excavation.

METHOD OF MEASUREMENT

151-3.1 No separate measurement of clearing and grubbing will be made. Work shall be considered necessary and incidental to the work of this contract.

BASIS OF PAYMENT

151-4.1 No separate measurement of clearing and grubbing will be made. Work shall be considered necessary and incidental to the work of this contract.

END OF ITEM P-151

Item P-152 Excavation, Subgrade, and Embankment

DESCRIPTION

152-1.1 This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, building construction, parking, or other purposes in accordance with these specifications and the Geotechnical Engineering Report, and in conformity to the dimensions and typical sections shown on the plans.

152-1.2 Classification. All material excavated shall be classified as defined below:

a. Unclassified excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature.

152-1.3 Unsuitable excavation. Unsuitable material shall be disposed in designated waste areas as shown on the plans. Materials containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material suitable for topsoil may be used on the embankment slope when approved by the RPR.

CONSTRUCTION METHODS

152-2.1 General. Before beginning excavation, grading, and embankment operations in any area, the area shall be cleared and grubbed in accordance with Item P-151.

The suitability of material to be placed in embankments shall be subject to approval by the RPR. All unsuitable material shall be disposed of off-site as detailed on the Plans.

When the Contractor's excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the RPR notified per Section 70, paragraph 70-20. At the direction of the RPR, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Areas outside the limits of the pavement areas where the top layer of soil has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches, to loosen and pulverize the soil. Stones or rock fragments larger than 4 inches in their greatest dimension will not be permitted in the top 6 inches of the subgrade.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the RPR, who shall arrange for their removal if necessary. The Contractor, at their own expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

a. Blasting. Blasting shall not be allowed.

152-2.2 Excavation. No excavation shall be started until the work has been staked out by the Contractor and the RPR has obtained from the Contractor, the survey notes of the elevations and measurements of the ground surface. The Contractor and RPR shall agree that the original ground lines shown on the original topographic mapping are accurate or agree to any adjustments made to the original ground lines.

Digital terrain model (DTM) files of the existing finished surfaces and other various surfaces were used to develop the design plans.

Volumetric quantities were calculated by comparing DTM files of the applicable design surfaces and generating Triangle Volume Reports. Electronic copies of DTM files and a paper copy of the original topographic map will be issued to the successful bidder**.**

Existing grades on the design cross sections or DTM's, where they do not match the locations of actual spot elevations shown on the topographic map, were developed by computer interpolation from those spot elevations. Prior to disturbing original grade, Contractor shall verify the accuracy of the existing ground surface by verifying spot elevations at the same locations where original field survey data was obtained as indicated on the topographic map. Contractor shall recognize that, due to the interpolation process, the actual ground surface at any particular location may differ somewhat from the interpolated surface shown on the design cross sections or obtained from the DTM's. Contractor's verification of original ground surface, however, shall be limited to verification of spot elevations as indicated herein, and no adjustments will be made to the original ground surface unless the Contractor demonstrates that spot elevations shown are incorrect. For this purpose, spot elevations which are within 0.1 foot of the stated elevations for ground surfaces, or within 0.04 foot for hard surfaces (pavements, buildings, foundations, structures, etc.) shall be considered "no change". Only deviations in excess of these will be considered for adjustment of the original ground surface. If Contractor's verification identifies discrepancies in the topographic map, Contractor shall notify the RPR in writing at least two weeks before disturbance of existing grade to allow sufficient time to verify the submitted information and make adjustments to the design cross sections or DTM's. Disturbance of existing grade in any area shall constitute acceptance by the Contractor of the accuracy of the original elevations shown on the topographic map for that area.

All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in the staging area. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes as shown on the plans. All unsuitable material shall be disposed of off-site.

The grade shall be maintained so that the surface is well drained at all times.

When the volume of the excavation exceeds that required to construct the embankments to the grades as indicated on the plans, the excess shall be used to grade the areas of ultimate development or disposed as directed by the RPR. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

a. Selective grading. When selective grading is indicated on the plans, the more suitable material designated by the RPR shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas until it can be placed. The more suitable material shall then be placed and compacted as specified. Selective grading shall be considered incidental to the work involved. The cost of stockpiling and placing the material shall be included in the various pay items of work involved.

b. Undercutting. Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches below the subgrade or to the depth specified by the RPR. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall disposed off the airport. The cost is incidental to this item. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a part of the embankment. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained in accordance with the details shown on the plans.

c. Over-break. Over-break, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the RPR. All over-break shall be graded or removed by the Contractor and disposed of as directed by the RPR. The RPR shall determine if the displacement of such material was unavoidable and their own decision shall be final. Payment will not be made for the removal and disposal of over-break that the RPR determines as avoidable. Unavoidable over-break will be classified as "Unclassified Excavation."

d. Removal of utilities. The removal of existing structures and utilities required to permit the orderly progress of work will be accomplished by the Contractor as indicated on the plans. All existing foundations shall be excavated at least 2 feet below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the RPR. All foundations thus excavated shall be backfilled with suitable material and compacted as specified for embankment or as shown on the plans. See SP-126 Removing Miscellaneous Structures for additional information.

152-2.3 Borrow excavation. Borrow areas are not required.

152-2.4 Drainage excavation. Drainage excavation shall consist of excavating drainage ditches including intercepting, inlet, or outlet ditches; or other types as shown on the plans. The work shall be performed in sequence with the other construction. Ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas or as directed by the RPR. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross-section and shall keep them free of debris or obstructions until the project is accepted.

152-2.5 Preparation of cut areas or areas where existing pavement has been removed. In those areas on which a subbase or base course is to be placed, the top 12 inches of subgrade shall be compacted to not less than 100% of maximum density for non-cohesive soils, and 95% of maximum density for cohesive soils as determined by ASTM D1557. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

152-2.6 Preparation of embankment area. All sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches and shall then be compacted per paragraph 152-2.10.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

152-2.7 Control Strip. The first half-day of construction of subgrade and/or embankment shall be considered as a control strip for the Contractor to demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of this specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor's expense. Full operations shall not begin until the control strip has been accepted by the RPR. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the RPR.

152-2.8 Formation of embankments. The material shall be constructed in lifts as established in the control strip, but not less than 6 inches nor more than 12 inches of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications.

The lifts shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the RPR. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained due to rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each lift shall be within ±2% of optimum moisture content before rolling to obtain the prescribed compaction. The material shall be moistened or aerated as necessary to achieve a uniform moisture content throughout the lift. Natural drying may be accelerated by blending in dry material or manipulation alone to increase the rate of evaporation.

The Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

The Contractor will take samples of excavated materials which will be used in embankment for testing and develop a Moisture-Density Relations of Soils Report (Proctor) in accordance with D 1557. A new Proctor shall be developed for each soil type based on visual classification.

Density tests will be taken by the Contractor for every 3,000 square yards of compacted embankment for each lift which is required to be compacted, or other appropriate frequencies as determined by the RPR.

If the material has greater than 30% retained on the 3/4-inch sieve, follow AASHTO T-180 Annex Correction of maximum dry density and optimum moisture for oversized particles.

Rolling operations shall be continued until the embankment is compacted to not less than 100% of maximum density for non-cohesive soils, and 95% of maximum density for cohesive soils as determined by ASTM D1557. Under all areas to be paved, the embankments shall be compacted as shown on the plans as determined by ASTM D1557. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches which shall be prepared for a seedbed in accordance with Item T-901.

The in-place field density shall be determined in accordance with ASTM 6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. The Contractor's laboratory shall perform all density tests in the RPR's presence and provide the test results upon completion to the RPR for acceptance. If the specified density is not attained, the area represented by the test or as designated by the RPR shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

Compaction areas shall be kept separate, and no lift shall be covered by another lift until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each lift is placed. Lift placement shall begin in the deepest portion of the embankment fill. As placement progresses, the lifts shall be constructed approximately parallel to the finished pavement grade line.

When rock, concrete pavement, asphalt pavement, and other embankment material are excavated at approximately the same time as the subgrade, the material shall be incorporated into the outer portion of the embankment and the subgrade material shall be incorporated under the future paved areas. Stones, fragmentary rock, and recycled pavement larger than 4 inches in their greatest dimensions will not be allowed in the top 12 inches of the subgrade. Rockfill shall be brought up in lifts as specified or as directed by the RPR and the finer material shall be used to fill the voids forming a dense, compact mass. Rock, cement concrete pavement, asphalt pavement, and other embankment material shall not be disposed of except at places and in the manner designated on the plans or by the RPR.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in lifts of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in lifts not exceeding 2 feet in thickness. Each lift shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The lift shall not be constructed above an elevation 4 feet below the finished subgrade.

Payment for compacted embankment will be made under embankment in-place and no payment will be made for excavation, borrow, or other items.

152-2.9 Proof rolling. The purpose of proof rolling the subgrade is to identify any weak areas in the subgrade and not for compaction of the subgrade. Before start of embankment, and after compaction is completed, the subgrade area shall be proof rolled with a 20 ton Tandem axle Dual Wheel Dump Truck loaded to the legal limit with tires inflated to 80/100/150 psi in the presence of the RPR. Apply a minimum of **25%** coverage, or as specified by the RPR, under pavement areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch (or show permanent deformation greater than 1 inch shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications. Removal and replacement of soft areas shall be per SP-100.

152-2.10 Compaction requirements. The subgrade under areas to be paved shall be compacted as shown on the plans, as determined by ASTM D1557. The subgrade in areas outside the limits of the pavement areas shall be compacted to a depth of 12 inches and to a density of not less than 95 percent of the maximum density as determined by ASTM D1557.

The material to be compacted shall be within ±2% of optimum moisture content before being rolled to obtain the prescribed compaction (except for expansive soils). When the material has greater than 30 percent retained on the ¾ inch sieve, follow the methods in ASTM D1557**.** Tests for moisture content and compaction will be taken at a minimum of **3,000** S.Y. of subgrade. All quality assurance testing shall be done by the Contractor's laboratory in the presence of the RPR, and density test results shall be furnished upon completion to the RPR for acceptance determination.

The in-place field density shall be determined in accordance with ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938 within 12 months prior to its use on this contract. The gage shall be field standardized daily.

Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

If the specified density is not attained, the entire lot shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the RPR and the finished subgrade shall be maintained.

152-2.11 Finishing and protection of subgrade. Finishing and protection of the subgrade is incidental to this item. Grading and compacting of the subgrade shall be performed so that it will drain readily. All low areas, holes or depressions in the subgrade shall be brought to grade. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans. All ruts or rough places that develop in the completed subgrade shall be graded, re-compacted, and retested. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes.

The Contractor shall maintain the completed course in satisfactory condition throughout placement of subsequent layers. No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been accepted by the RPR.

152-2.12 Haul. All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

The Contractor's equipment shall not cause damage to any excavated surface, compacted lift or to the subgrade as a result of hauling operations. Any damage caused as a result of the Contractor's hauling operations shall be repaired at the Contractor's expense.

The Contractor shall be responsible for providing, maintaining and removing any haul roads or routes within or outside of the work area, and shall return the affected areas to their former condition, unless otherwise authorized in writing by the Owner. No separate payment will be made for any work or materials associated with providing, maintaining and removing haul roads or routes.

152-2.13 Surface Tolerances. In those areas on which a subbase or base course is to be placed, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches, reshaped and re-compacted to grade until the required smoothness and accuracy are obtained and approved by the RPR. The Contractor shall perform all final smoothness and grade checks in the presence of the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

a. Smoothness. The finished surface shall not vary more than +/- ½ inch when tested with a 12-foot straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot straightedge for the full length of each line on a 50-foot grid.

b. Grade. The grade and crown shall be measured on a 25-foot grid and shall be within +/-0.05 feet of the specified grade.

On safety areas, turfed areas and other designated areas within the grading limits where no subbase or base is to placed, grade shall not vary more than 0.10 feet from specified grade. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.14 Topsoil. When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled at approved locations. Stockpiles shall be located as shown on the plans and the approved CSPP and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the RPR, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further re-handling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as shown on the plans and as required in Item T-905. Topsoil shall be paid for as provided in Item T-905.

METHOD OF MEASUREMENT

Measurement for payment specified by the cubic yard shall be computed by the comparison of digital terrain model (DTM) surfaces for open ground. Contractor shall provide topo survey of the ground prior to excavation, after excavation, and after embankment.

152-3.1 The quantity of excavation and haul-off to be paid for shall be the number of cubic yards measured in its original position. The area established after the removal of all pavement shall be considered the existing condition. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than those directed.

152-3.2 The quantity of embankment in place shall be the number of cubic yards excavated, hauled, worked, compacted, and accepted, measured in its final position. No separate measurement will be made for any blending of existing or imported fill materials.

152-3.3 Stockpiled material shall not be measured for payment**.**

152-3.4 Subgrade preparation shall be paid for by the square yard for scarifying, proof-rolling, recompacting, building, and shaping the native subgrade to conform to the typical sections, lines, and grades as shown on the plans for the areas to be lime-treated and under crushed aggregate base shoulders. Subgrade Stabilization, Excavation Below Subgrade shall be per SP-100.

BASIS OF PAYMENT

152-4.1 Unclassified Excavation and Haul-off. Payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, off-hauling and disposing of excess materials from the site, and incidentals necessary to complete the item.

152-4.2 Embankment in Place. For embankment in place, payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, blending with existing base and subgrade material, and incidentals necessary to complete the item.

152-4.3 Subgrade Preparation. Payment shall be made at the contract unit price per square yard for the subgrade preparation for the areas to be lime-treated and under crushed aggregate base shoulders. The price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item including scarifying, watering, proof rolling, compacting, and finish grading the subgrade surface to the elevations as shown on the plans. All areas not included in the lime-treated or pavement shoulders areas shall not be paid under this item, but under *Embankment in Place* instead.

152-4.4 Utility installations. Excavation, off haul, disposal, and native backfill required for utility installations are included in the bid items for the respective utility and no additional payment shall be made.

Payment will be made under:

Item P-152-4.1	Unclassified Excavation and Haul-off - per cubic yard
Item P-152-4.2	Embankment in place - per cubic yard
Item P-152-4.3	Subgrade Preparation - per square yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO T-180	Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

ASTM International (ASTM)

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3)
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2700 kN-m/m^3))
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

Advisory Circulars (AC)

AC 150/5370-2	Operational Safety on Airports During Construction Software

Software

FAARFIELD – FAA Rigid and Flexible Iterative Elastic Layered Design

U.S. Department of Transportation

FAA RD-76-66 Design and Construction of Airport Pavements on Expansive Soils

END OF ITEM P-152

Item P-153 Controlled Low-Strength Material (CLSM)

DESCRIPTION

153-1.1 This item shall consist of furnishing, transporting, and placing a controlled low-strength material (CLSM) as flowable backfill in trenches or at other locations shown on the plans or as directed by the Resident Project Representative (RPR).

MATERIALS

153-2.1 Materials.

a. Cement. Cement shall conform to the requirements of ASTM **C150** Type **V**.

b. Fly ash. Fly ash shall conform to ASTM C618, Class C or F.

c. Fine aggregate (sand). Fine aggregate shall conform to the requirements of ASTM C33 except for aggregate gradation. Any aggregate gradation which produces the specified performance characteristics of the CLSM and meets the following requirements, will be accepted.

Sieve Size	Percent Passing by weight
3/4 inch	100
No. 200	0 - 12

d. Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

MIX DESIGN

153-3.1 Proportions. The Contractor shall submit, to the RPR, a mix design including the proportions and source of aggregate, fly ash, cement, water, and approved admixtures. No CLSM mixture shall be produced for payment until the RPR has given written approval of the proportions. The proportions shall be prepared by a laboratory and shall remain in effect for the duration of the project. The proportions shall establish a single percentage or weight for aggregate, fly ash, cement, water, and any admixtures proposed. Laboratory costs are incidental to this item.

a. Compressive strength. CLSM shall be designed to achieve a 28-day compressive strength of 100 to 200 psi (690 to 1379 kPa) when tested in accordance with ASTM D4832, with no significant strength gain after 28 days.

b. Consistency. Design CLSM to achieve a consistency that will produce an approximate 8-inch diameter circular-type spread without segregation. CLSM consistency shall be determined per ASTM D6103.

CONSTRUCTION METHODS

153-4.1 Placement.

a. Placement. CLSM may be placed by any reasonable means from the mixing unit into the space to be filled. Agitation is required during transportation and waiting time. Placement shall be performed so structures or pipes are not displaced from their final position and intrusion of CLSM into unwanted areas is avoided. The material shall be brought up uniformly to the fill line shown on the plans or as directed by the RPR. Each placement of CLSM shall be as continuous an operation as possible. If CLSM is placed in more than one lift, the base lift shall be free of surface water and loose foreign material prior to placement of the next lift.

b. Contractor Quality Control. The Contractor shall collect all batch tickets to verify the CLSM delivered to the project conforms to the mix design. The Contractor shall verify daily that the CLSM is consistent with 153-3.1a and 153-3.1b. Adjustments shall be made as necessary to the proportions and materials as needed. The Contractor shall provide all batch tickets to the RPR.

c. Limitations of placement. CLSM shall not be placed on frozen ground. Mixing and placing may begin when the air or ground temperature is at least 35°F (2°C) and rising. Mixing and placement shall stop when the air temperature is 40°F (4°C) and falling or when the anticipated air or ground temperature will be 35°F (2°C) or less in the 24-hour period following proposed placement. At the time of placement, CLSM shall have a temperature of at least 40°F (4°C).

153-4.2 Curing and protection

a. Curing. The air in contact with the CLSM shall be maintained at temperatures above freezing for a minimum of 72 hours. If the CLSM is subjected to temperatures below 32°F (0°C), the material may be rejected by the RPR if damage to the material is observed.

b. Protection. The CLSM shall not be subject to loads and shall remain undisturbed by construction activities for a period of 48 hours or until a compressive strength of 15 psi (105 kPa) is obtained. The Contractor shall be responsible for providing evidence to the RPR that the material has reached the desired strength. Acceptable evidence shall be based upon compressive tests made in accordance with paragraph 153-3.1a.

153-4.3 Quality Assurance (QA) Acceptance. CLSM QA acceptance shall be based upon batch tickets provided by the Contractor to the RPR to confirm that the delivered material conforms to the mix design.

METHOD OF MEASUREMENT

153-5.1 When required to protect in place existing utilities within proposed pavement areas, controlled low-strength material (CLSM) shall be measured by the number of cubic yards as specified, completed, and accepted.

153-5.2 No separate measurement for payment shall be made for CLSM required for new utilities or when referenced in any other specification.

BASIS OF PAYMENT

153-6.1 Payment. Controlled low-strength material (CLSM) shall be paid for at the contract unit price per cubic yard. Payment shall be full compensation for all materials, equipment, labor, and incidentals required to complete the work as specified.

Payment will be made under:

Item P-153-6.1 Controlled low-strength material (CLSM) for Existing Utility Protection – per cubic yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C33	Standard Specification for Concrete Aggregates
ASTM C150	Standard Specification for Portland Cement
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements

ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D4832	Standard Test Method for Preparation and Testing of Controlled Low-Strength Material (CLSM) Test Cylinders
ASTM D6103	Flow Consistency of Controlled Low Strength Material (CLSM)

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Item P-155 Lime-Treated Subgrade

DESCRIPTION

155-1.1 This item shall be used for soil modification that require strength gain to a specific level. This item shall consist of constructing one or more courses of a mixture of soil, lime, and water in accordance with this specification, the Geotechnical Engineering Report, and in conformity with the lines, grades, thicknesses, and typical cross-sections shown on the plans.

MATERIALS

155-2.1 Lime. Quicklime, hydrated lime, and either high-calcium dolomitic, or magnesium lime, as defined by ASTM C51, shall conform to the requirements of ASTM C977. Lime not produced from calcining limestone is not permitted.

155-2.2 Commercial lime slurry. Not used.

a. Chemical composition. Not used.

b. Residue. Not used.

c. Grade. Not used.

155-2.3 Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

155-2.4 Soil. The soil for this work shall consist of on-site materials free of roots, sod, weeds, and stones larger than 2-1/2 inches and have a sulfate content of less than 0.3%.

COMPOSITION

155-3.1 Soil-lime mixture. Lime shall be applied at a minimum 5% dry unit weight of soil for the depth of subgrade treatment as shown on the plans. There will be a minimum of two treatments per P-155.6.2 to mitigate against sulfate heave.

155-3.2 Tolerances. At final compaction, the lime and water content for each course of subgrade treatment shall conform to the following tolerances:

Tolerances

Material	Tolerance
Lime	+ 0.5%[1]
Water	+ 2%, -0%

[1] Limit is per application, so two applications will allow for 1% overage. Three applications, if required, will allow for 1.5% overage.

WEATHER LIMITATIONS

155-4.1 Weather limitation. Subgrade shall not be constructed when weather conditions detrimentally affect the quality of the materials. Lime shall not be applied unless the air temperature is at least 40°F and rising. Lime shall not be applied to soils that are frozen or contain frost. Protect completed lime-treated areas by approved methods against the detrimental effects of freezing if the air temperature falls below 35°F. Remove and replace any damaged portion of the completed soil-lime treated area with new soil-lime material in accordance with this specification.

EQUIPMENT

155-5.1 Equipment. All equipment necessary to grade, scarify, spread, mix and compact the material shall be provided. The Resident Project Representative (RPR) must approve the Contractor's proposed equipment prior to the start of the treatment.

CONSTRUCTION METHODS

155-6.1 General. This specification is to construct a subgrade consisting of a uniform lime mixture which shall be free from loose or segregated areas. The subgrade shall be of uniform density and moisture content, well mixed for its full depth, and have a smooth surface suitable for placing subsequent lifts. The Contractor shall be responsible to meet the above requirements.

Prior to any treatment, the subgrade shall be constructed as specified in Item P-152, Excavation, Subgrade and Embankment, and shaped to conform to the typical sections, lines, and grades as shown on the plans.

The mixing equipment must give visible indication at all times that it is cutting, pulverizing and mixing the material uniformly to the proper depth over the full width of the cut.

155-6.2 Application. Lime will be applied in a minimum of two (2) treatments. The initial treatment shall be at 3%. The second treatment shall be at 2%. For both treatments, lime shall be uniformly spread only over an area where the mixing operations can be completed during the same workday. Lime shall not be applied when wind conditions are detrimental to proper application. A motor grader shall not be used to spread the lime. Adequate moisture shall be added to the lime/soil mixture to maintain the proper moisture content. Materials shall be handled, stored, and applied in accordance with all federal, state, and local requirements.

155-6.3 Mixing. The mixing procedure shall be as described below:

a. Initial treatment. The full depth of the treated subgrade shall be mixed with an approved mixing machine. Lime shall not be left exposed for more than six (6) hours. The mixing machine shall make two coverages. Water shall be added to the subgrade during mixing to provide a moisture content approximately 4% to 5% above the optimum moisture of the material and to ensure chemical reaction of the lime and subgrade. After mixing, the subgrade shall be lightly rolled to seal the surface and help prevent evaporation of moisture. The initial treatment requires a seven (7) day mellowing period. During the mellowing period, the treated soil shall be re-mixed a minimum of three (3) times after initial mixing procedures. After each re-mixing, the subgrade shall be lightly rolled to seal the surface and help prevent evaporation of moisture. In addition, soil moisture content shall be checked frequently and additional moisture added to maintain optimum moisture.

b. Second treatment. After the initial treatment and mellowing period, the second treatment shall commence. The full depth of the treated subgrade shall be mixed with an approved mixing machine. Lime shall not be left exposed for more than six (6) hours. The mixing machine shall make two coverages. Water shall be added to the subgrade during mixing to provide a moisture content approximately 4% to 5% above the optimum moisture of the material and to ensure chemical reaction of the lime and subgrade. After mixing, the subgrade shall be lightly rolled to seal the surface and help prevent evaporation of moisture. The second treatment requires a 48-hour mellowing period. During the mellowing period, the treated soil shall be re-mixed a minimum of one (1) time after second mixing procedures. In addition, soil moisture content shall be checked frequently and additional moisture added to maintain optimum moisture.

c. Soluble Sulfate Verification. After the required mellowing time following the second treatment and prior to final mixing, samples of treated soil shall be obtained every 5,000 square feet of treated soil area. Samples shall be tested by Contractor to verify remaining soluble sulfate levels in the soil. If any test has remaining soluble sulfates exceeding 3,000 ppm, a third treatment, similar to the second treatment, shall be made according to P-155-6.3.b. for the area between adjacent passing sulfate tests. Areas re-treated due to sulfate concentration shall be resampled after a third treatment and mellowing time.

d. Final mixing. After the required mellowing time and soluble sulfate verification, the material shall be uniformly mixed by approved methods. Any clods shall be reduced in size by blading, discing, harrowing,

scarifying, or by the use of other approved pulverization methods. After curing, pulverize lime treated material until 100% of soil particles pass a one inch sieve and 60% pass the No. 4 sieve when tested dry by laboratory sieves. If resultant mixture contains clods, reduce their size by scarifying, remixing, or pulverization to meet specified gradation.

155-6.4 Control Strip. The first half-day of construction shall be considered the control strip. The Contractor shall demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of the specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor's expense. Full operations shall not continue until the control strip has been accepted by the RPR. Upon acceptance of the control strip by the RPR, the Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the RPR.

155-6.5 Treatment Application and Depth Checks. The depth and amount of stabilization for each treatment shall be measured by the Contractor with no less than 2 tests per day of material placed; test shall be witnessed by the RPR. Measurements shall be made in test holes excavated to show the full depth of mixing and the pH checked by spraying the side of the test hole with a pH indicator such as phenolphthalein. Phenolphthalein changes from clear to red between pH 8.3 and 10. The color change indicates the location of the bottom of the mixing zone. pH indicators other than phenolphthalein can be used to measure pH levels. If the pH is not at least 8.3 and/or if the depth of the treated subgrade is more than 1/2 inch deficient, additional lime treatment shall be added, and the material remixed at no additional cost to the project. The Contractor shall correct all such areas in a manner satisfactory to the RPR.

155-6.6 Compaction. Compaction of the mixture shall immediately follow the final mixing operation with the mixture compacted within 1 to 4 hours after final mixing. The material shall be at the moisture content specified in paragraph 155-3.2 during compaction. The field density of the compacted mixture shall be at least 95% of the maximum density as specified in paragraph 155-6.10. Perform in-place density test to determine degree of compaction between 24 and 72 hours after final compaction and the 24-hour moist cure period. If the material fails to meet the density requirements, it shall be reworked to meet the density requirements. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

155-6.7 Finishing and curing. After the final lift or course of lime-treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections. The completed section shall then be finished by rolling, as directed by the RPR, with a pneumatic or other suitable roller sufficiently light to prevent hairline cracking. The finished surface shall not vary more than 1/2-inch when tested with a 12-foot straightedge applied parallel with and at right angles to the pavement centerline. Any variations in excess of this tolerance shall be corrected by the Contractor at the Contractor's expense in a manner satisfactory to the RPR.

The completed section shall be moist-cured for a minimum of two (2) days before further courses are added or any traffic is permitted, unless otherwise directed by the RPR. The final lift should not be exposed for more than 14 days without protection or the placement of a base course material.

155-6.8 Maintenance. The Contractor shall protect and maintain the lime-treated subgrade from yielding until the lime-treated subgrade is covered by placement of the next lift. When material has been exposed to excessive rain, snow, or freeze-thaw conditions, prior to placement of additional material, the Contractor shall verify that materials still meet all specification requirements. The maintenance cost shall be incidental to this item.

155-6.9 Surface tolerance. In those areas on which a subbase or base course is to be placed, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches, reshaped and re-compacted to grade until the required smoothness and accuracy are obtained and

approved by the RPR. The Contractor shall perform all final smoothness and grade checks in the presence of the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

a. Smoothness. The finished surface shall not vary more than +/- ½ inch when tested with a 12-foot straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot straightedge for the full length of each line on a 50-foot grid.

b. Grade. The grade and crown shall be measured on a 25-foot grid and shall be within +/-0.05 feet of the specified grade.

155-6.10 Acceptance sampling and testing. The lime treated subgrade shall be accepted for density and thickness on an area basis. Testing frequency shall be a minimum of one compaction and thickness test per 1000 SY of lime treated subgrade, but not less than four (4) tests per day of production. Sampling locations will be determined on a random basis per ASTM D3665.

a. Density. All testing shall be done by the Contractor's laboratory in the presence of the RPR and density test results shall be furnished upon completion to the RPR for acceptance determination.

The field density of the compacted mixture shall be at least 95% of the maximum density of laboratory specimens prepared from samples taken from the material in place. The specimens shall be compacted and tested in accordance with ASTM D698 to determine maximum density and optimum moisture content. The in-place field density shall be determined in accordance with ASTM D6938, Procedure A, direct transmission method. If the material fails to meet the density requirements, the area represented by the failed test shall be reworked to meet the density requirements. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

b. Thickness. The thickness of the course shall be within +0 and -1/2 inch of the specified thickness as determined by depth tests taken by the Contractor in the presence of the RPR for each area. Where the thickness is deficient by more than 1/2-inch, the Contractor shall correct such areas at no additional cost The Contractor shall replace, at his expense, material where depth tests have been taken.

155-6.11 Handling and safety. The Contractor shall obtain and enforce the lime supplier's instructions for proper safety and handling of the lime to prevent physical eye or skin contact with lime during transport or application.

METHOD OF MEASUREMENT

155-7.1 Lime-treated subgrade shall be paid for by the square yard in the completed and accepted work, including lime, all remixing, and sulfate verification.

155-7.2 Lime will not be measured separately.

BASIS OF PAYMENT

155-8.1 Payment shall be made at the contract unit price per square yard for the lime-treated subgrade at the thickness specified. The price shall be full compensation for furnishing all material, including lime, and for all preparation, delivering, placing and mixing these materials, including up to 3 mixes, residual soluble sulfate testing, and all labor, equipment, tools and incidentals necessary to complete this item.

Payment will be made under:

Item P-155-8.1 Lime-treated subgrade, 16" Depth - per square yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C51	Standard Terminology Relating to Lime and Limestone (as used by the Industry)
ASTM C977	Standard Specification for Quicklime and Hydrated Lime for Soil Stabilization
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3)
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

Software

FAARFIELD – FAA Rigid and Flexible Iterative Elastic Layered Design

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Item P-209 Crushed Aggregate Base Course

DESCRIPTION

209-1.1 This item consists of a base course composed of crushed aggregate base constructed on a prepared course in accordance with these specifications and in conformity to the dimensions and typical cross-sections shown on the plans.

MATERIALS

209-2.1 Crushed aggregate base. Crushed aggregate shall consist of clean, sound, durable particles of crushed stone, crushed gravel, and shall be free from coatings of clay, silt, organic material, clay lumps or balls or other deleterious materials or coatings. The method used to produce the crushed gravel shall result in the fractured particles in the finished product as consistent and uniform as practicable. Fine aggregate portion, defined as the portion passing the No. 4 sieve shall consist of fines from the coarse aggregate crushing operation. The fine aggregate shall be produced by crushing stone, gravel, that meet the coarse aggregate requirements for wear and soundness. Aggregate base material requirements are listed in the following table.

Crushed Aggregate Base Material Requirements

Material Test	Requirement	Standard
Coarse Aggregate		
Resistance to Degradation	Loss: 45% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Percentage of Fractured Particles	Minimum 90% by weight of particles with at least two fractured faces and 100% with at least one fractured face[1]	ASTM D5821
Flat Particles, Elongated Particles, or Flat and Elongated Particles	10% maximum, by weight, of flat, elongated, or flat and elongated particles [2]	ASTM D4791
Clay lumps and friable particles	Less than or equal to 3 percent	ASTM C142
Fine Aggregate		
Liquid limit	Less than or equal to 25	ASTM D4318
Plasticity Index	Not more than five (5)	ASTM D4318

[1] The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

[2] A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

209-2.2 Gradation requirements. The gradation of the aggregate base material shall meet the requirements of the gradation given in the following table when tested per ASTM C117 and ASTM C136. The gradation shall be well graded from coarse to fine and shall not vary from the lower limit on one sieve to the high limit on an adjacent sieve or vice versa.

Gradation of Aggregate Base

Sieve Size	Design Range Percentage by Weight Passing	Contractor's Final Gradation	Job Control Grading Band Tolerances[1] (Percent)
2-inch	100		0
1-1/2 inch	95-100		±5
1 inch	70-95		±8
3/4 inch	55-85		±8
No. 4	30-60		±8
No. 40[2]	10-30		±5
No. 200[2]	0-10		±3

[1] The "Job Control Grading Band Tolerances for Contractor's Final Gradation" in the table shall be applied to "Contractor's Final Gradation" to establish a job control grading band. The full tolerance still applies if application of the tolerances results in a job control grading band outside the design range.

[2] The fraction of material passing the No 200 sieve shall not exceed two-thirds the fraction passing the No 40 sieve.

209-2.3 Sampling and Testing.

a. Aggregate base materials. The Contractor shall take samples of the aggregate base in accordance with ASTM D75 to verify initial aggregate base requirements and gradation. Material shall meet the requirements in paragraph 209-2.1. This sampling and testing will be the basis for approval of the aggregate base quality requirements.

b. Gradation requirements. The Contractor shall take at least two aggregate base samples per day in the presence of the Resident Project Representative (RPR) to check the final gradation. Sampling shall be per ASTM D75. Material shall meet the requirements in paragraph 209-2.2. The samples shall be taken from the in-place, un-compacted material at sampling points and intervals designated by the RPR.

209-2.4 Separation Geotextile. Not used.

CONSTRUCTION METHODS

209-3.1 Control strip. The first half-day of construction shall be considered the control strip. The Contractor shall demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of the specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted or removed and replaced at the Contractor's expense. Full operations shall not continue until the control strip has been accepted by the RPR. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved by the RPR.

209-3.2 Preparing underlying subgrade and/or subbase. The underlying subgrade and/or subbase shall be checked and accepted by the RPR before base course placing and spreading operations begin. Re-proof rolling of the subgrade or proof rolling of the subbase in accordance with Item P-152, at the Contractor's expense, may be required by the RPR if the Contractor fails to ensure proper drainage or protect the subgrade and/or subbase. Any ruts or soft, yielding areas due to improper drainage conditions, hauling, or any other cause, shall be corrected before the base course is placed. To ensure proper drainage, the spreading of the base shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope.

209-3.3 Production. The aggregate shall be uniformly blended and, when at a satisfactory moisture content per paragraph 209-3.5, the approved material may be transported directly to the placement.

209-3.4 Placement. The aggregate shall be placed and spread on the prepared underlying layer by spreader boxes or other devices as approved by the RPR, to a uniform thickness and width. The equipment shall have positive thickness controls to minimize the need for additional manipulation of the material. Dumping from vehicles that require re-handling shall not be permitted. Hauling over the uncompacted base course shall not be permitted.

The aggregate shall meet gradation and moisture requirements prior to compaction. The base course shall be constructed in lifts as established in the control strip, but not less than 4 inches nor more than 12 inches of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications at the Contractor's expense.

209-3.5 Compaction. Immediately after completion of the spreading operations, compact each layer of the base course, as specified, with approved compaction equipment. The number, type, and weight of rollers shall be sufficient to compact the material to the required density within the same day that the aggregate is placed on the subgrade.

The field density of each compacted lift of material shall be at least 100% of the maximum density of laboratory specimens prepared from samples of the subbase material delivered to the jobsite. The laboratory specimens shall be compacted and tested in accordance with ASTM D1557. The moisture content of the material during placing operations shall be within ±2 percentage points of the optimum moisture content as determined by ASTM D1557. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

209-3.6 Weather limitations. Material shall not be placed unless the ambient air temperature is at least 40°F and rising. Work on base course shall not be conducted when the subgrade or subbase is wet or frozen or the base material contains frozen material.

209-3.7 Maintenance. The base course shall be maintained in a condition that will meet all specification requirements. When material has been exposed to excessive rain, snow, or freeze-thaw conditions, prior to placement of additional material, the Contractor shall verify that materials still meet all specification requirements. Equipment may be routed over completed sections of base course, provided that no damage results and the equipment is routed over the full width of the completed base course. Any damage resulting to the base course from routing equipment over the base course shall be repaired by the Contractor at the Contractor's expense.

209-3.8 Surface tolerances. After the course has been compacted, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches, reshaped and recompacted to grade until the required smoothness and accuracy are obtained and approved by the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense. The smoothness and accuracy requirements specified here apply only to the top layer when base course is constructed in more than one layer.

a. Smoothness. The finished surface shall not vary more than 3/8-inch when tested with a 12-foot straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot straightedge for the full length of each line on a 50-foot grid.

b. Grade. The grade and crown shall be measured on a 25-foot grid and shall be within +0 and -1/2 inch of the specified grade.

209-3.9 Acceptance sampling and testing. Crushed aggregate base course shall be accepted for density and thickness on an area basis. Two tests shall be made for density and thickness for each 1200 square yds. Sampling locations will be determined on a random basis per ASTM D3665

a. Density. The Contractor's laboratory shall perform all density tests in the RPR's presence and provide the test results upon completion to the RPR for acceptance.

Each area shall be accepted for density when the field density is at least 100% of the maximum density of laboratory specimens compacted and tested per ASTM D 1557. The in-place field density shall be determined per ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. If the specified density is not attained, the area represented by the failed test must be reworked and/or recompacted and two additional random tests made. This procedure shall be followed until the specified density is reached. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

b. Thickness. The Contractor shall notify the RPR, prior to the completion of P-152 subgrade, of the Contractor's intent to utilize Option A or Option B to verify appropriate base thickness was achieved.

Option A: Depth tests shall be made by test holes at least 3 inches in diameter that extend through the base. The thickness of the base course shall be within +0 and -1/2 inch of the specified thickness as determined by depth tests taken by the Contractor in the presence of the RPR for each area. Where the thickness is deficient by more than 1/2-inch, the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches, adding new material of proper gradation, and the material shall be blended and recompacted to grade. The Contractor shall replace, at his expense, base material where depth tests have been taken.

Option B: In lieu of depth tests, Contractor may provide topographic survey of the top of the completed P-152 sub-grade and topographic survey of the top of the completed P-209 base course. Survey shall be performed on a 5-point cross section, every 50-feet. The thickness of the base course shall be within +0 and -1/2 inch of the specified thickness. Where the thickness is deficient by more than 1/2-inch, the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches, adding new material of proper gradation, and the material shall be blended and recompacted to grade.

METHOD OF MEASUREMENT

209-4.1 The quantity of crushed aggregate base course will be determined by measurement of the number of cubic yards of material actually constructed and accepted by the RPR as complying with the plans and specifications. Base materials shall not be included in any other excavation quantities.

BASIS OF PAYMENT

209-5.1 Payment shall be made at the contract unit price per cubic yard for crushed aggregate base course. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-209-5.1	Crushed Aggregate Base Course, P-209 - per cubic yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate

ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2700 kN-m/m^3))
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4491	Standard Test Methods for Water Permeability of Geotextiles by Permittivity
ASTM D4643	Standard Test Method for Determination of Water Content of Soil and Rock by Microwave Oven Heating
ASTM D4751	Standard Test Methods for Determining Apparent Opening Size of a Geotextile
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D7928	Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis

American Association of State Highway and Transportation Officials (AASHTO)

M288	Standard Specification for Geosynthetic Specification for Highway Applications

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Item P-401 Asphalt Mix Pavement

DESCRIPTION

401-1.1 This item shall consist of pavement courses composed of mineral aggregate and asphalt binder mixed in a central mixing plant and placed on a prepared base or stabilized course in accordance with these specifications and shall conform to the lines, grades, thicknesses, and typical cross-sections shown on the plans. Each course shall be constructed to the depth, typical section, and elevation required by the plans and shall be rolled, finished, and approved before the placement of the next course.

MATERIALS

401-2.1 Aggregate. Aggregates shall consist of crushed stone, crushed gravel, crushed slag, screenings, natural sand, and mineral filler, as required. The aggregates should have no known history of detrimental pavement staining due to ferrous sulfides, such as pyrite. Coarse aggregate is the material retained on the No. 4 sieve. Fine aggregate is the material passing the No. 4 sieve.

a. Coarse aggregate. Coarse aggregate shall consist of sound, tough, durable particles, free from films of matter that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other deleterious substances. Coarse aggregate material requirements are given in the table below.

Coarse Aggregate Material Requirements

Material Test	Requirement	Standard
Resistance to Degradation	Loss: 40% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate **or** Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	1.0 % maximum	ASTM C142
Percentage of Fractured Particles	For pavements designed for aircraft gross weights of 60,000 pounds or more: Minimum 75% by weight of particles with at least two fractured faces and 85% with at least one fractured face[1]	ASTM D5821
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles at 5:1 [2]	ASTM D4791
Bulk density of slag [3]	Weigh not less than 70 pounds per cubic foot	ASTM C29

[1] The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

[2] A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

[3] Only required if slag is specified.

b. Fine aggregate. Fine aggregate shall consist of clean, sound, tough, durable, angular shaped particles produced by crushing stone, slag, or gravel and shall be free from coatings of clay, silt, or other objectionable matter. Natural (non-manufactured) sand may be used to obtain the gradation of the fine aggregate blend or to improve the workability of the mix. Fine aggregate material requirements are listed in the table below.

Fine Aggregate Material Requirements

Material Test	Requirement	Standard
Liquid limit	25 maximum	ASTM D4318
Plasticity Index	4 maximum	ASTM D4318
Soundness of Aggregates by Use of Sodium Sulfate **or** Magnesium Sulfate	Loss after 5 cycles: 10% maximum using Sodium sulfate - or - 15% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	1.0 % maximum	ASTM C142
Sand equivalent	45 minimum	ASTM D2419
Natural Sand	0% to 15% maximum by weight of total aggregate	ASTM D1073

c. Sampling. ASTM D75 shall be used in sampling coarse and fine aggregate.

401-2.2 Mineral filler. Mineral filler (baghouse fines) may be added in addition to material naturally present in the aggregate. Mineral filler shall meet the requirements of ASTM D242.

Mineral Filler Requirements

Material Test	Requirement	Standard
Plasticity Index	4 maximum	ASTM D4318

401-2.3 Asphalt binder. Asphalt binder shall conform to ASTM D6373 Performance Grade (PG) **70-10**.

401-2.4 Anti-stripping agent. Any anti-stripping agent or additive (anti-strip) shall be heat stable and shall not change the asphalt binder grade beyond specifications. Anti-strip shall be an approved material of the Department of Transportation of the State in which the project is located.

COMPOSITION

401-3.1 Composition of mixture(s). The asphalt mix shall be composed of a mixture of aggregates, filler and anti-strip agent if required, and asphalt binder. The aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF).

401-3.2 Job mix formula (JMF) laboratory. The laboratory used to develop the JMF shall possess a current certificate of accreditation, listing D3666 from a national accrediting authority and all test methods required for developing the JMF; and be listed on the accrediting authority's website. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Resident Project Representative (RPR) prior to start of construction.

401-3.3 Job mix formula (JMF). No asphalt mixture shall be placed until an acceptable mix design has been submitted to the RPR for review and accepted in writing. The RPR's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

When the project requires asphalt mixtures of differing aggregate gradations and/or binders, a separate JMF shall be submitted for each mix. Add anti-stripping agent to meet tensile strength requirements.

The JMF shall be prepared by an accredited laboratory that meets the requirements of paragraph 401-3.2. The asphalt mixture shall be designed using procedures contained in Asphalt Institute MS-2 Mix Design Manual, 7th Edition**.** Samples shall be prepared and compacted using a Marshall compactor in accordance with ASTM D6926.

Should a change in sources of materials be made, a new JMF must be submitted to the RPR for review and accepted in writing before the new material is used. After the initial production JMF has been approved by the RPR and a new or modified JMF is required for whatever reason, the subsequent cost of the new or modified JMF, including a new control strip when required by the RPR, will be borne by the Contractor.

The RPR may request samples at any time for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

The JMF shall be submitted in writing by the Contractor at least 30 days prior to the start of paving operations. The JMF shall be developed within the same construction season using aggregates proposed for project use.

The JMF shall be dated, and stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

- Manufacturer's Certificate of Analysis (COA) for the asphalt binder used in the JMF in accordance with paragraph 401-2.3. Certificate of asphalt performance grade is with modifier already added, if used and must indicate compliance with ASTM D6373. For plant modified asphalt binder, certified test report indicating grade certification of modified asphalt binder.
- Manufacturer's Certificate of Analysis (COA) for the anti-stripping agent if used in the JMF in accordance with paragraph 401-2.4.
- Certified material test reports for the course and fine aggregate and mineral filler in accordance with paragraphs 401-2.1.
- Percent passing each sieve size for individual gradation of each aggregate cold feed and/or hot bin; percent by weight of each cold feed and/or hot bin used; and the total combined gradation in the JMF.
- Specific Gravity and absorption of each coarse and fine aggregate.
- Percent natural sand.
- Percent fractured faces.
- Percent by weight of flat particles, elongated particles, and flat and elongated particles (and criteria).
- Percent of asphalt.
- Number of blows
- Laboratory mixing and compaction temperatures.
- Supplier-recommended field mixing and compaction temperatures.
- Plot of the combined gradation on a 0.45 power gradation curve.
- Graphical plots of air voids, voids in the mineral aggregate (VMA), and unit weight versus asphalt content. To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.
- Tensile Strength Ratio (TSR).
- Type and amount of Anti-strip agent when used.
- Asphalt Pavement Analyzer (APA) results.
- Date the JMF was developed. Mix designs that are not dated or which are from a prior construction season shall not be accepted.

Table 1. Asphalt Design Criteria

Test Property	Value	Test Method
Number of blows	75	
Air voids (%)	3.5	ASTM D3203
Percent voids in mineral aggregate (VMA), minimum	See Table 2	ASTM D6995
Tensile Strength Ratio (TSR)[1]	not less than 80 at a saturation of 70-80%	ASTM D4867
Asphalt Pavement Analyzer (APA)[2]	Less than 10 mm @ 4000 passes	AASHTO T340 at 250 psi hose pressure at 64°C test temperature

1 Test specimens for TSR shall be compacted at 7 ± 1.0 % air voids. In areas subject to freeze-thaw, use freeze-thaw conditioning in lieu of moisture conditioning per ASTM D4867.

2 AASHTO T340 at 100 psi hose pressure at 64°C test temperature may be used in the interim. If this method is used the required Value shall be less than 5 mm @ 8000 passes.

3 Where APA not available, use Hamburg Wheel test (AASHTO T-324) 10mm @ 20,000 passes at 50°C.

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation or gradations specified in Table 2 when tested in accordance with ASTM C136 and ASTM C117.

The gradations in Table 2 represent the limits that shall determine the suitability of aggregate for use from the sources of supply; be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa.

Table 2. Aggregate - Asphalt Pavements

Sieve Size	Percentage by Weight Passing Sieve
1 inch (25.0 mm)	**--**
3/4 inch (19.0 mm)	**100**
1/2 inch (12.5 mm)	**90-100**
3/8 inch (9.5 mm)	**72-88**
No. 4 (4.75 mm)	**53-73**
No. 8 (2.36 mm)	**38-60**
No. 16 (1.18 mm)	**26-48**
No. 30 (600 µm)	**18-38**
No. 50 (300 µm)	**11-27**
No. 100 (150 µm)	**6-18**
No. 200 (75 µm)	**3-6**
Minimum Voids in Mineral Aggregate (VMA)[1]	**15.0**
Asphalt Percent:	
Stone or gravel	**5.0-7.5**
Slag	**6.5-9.5**
Recommended Minimum Construction Lift Thickness	**2 inch**

[1]To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when aggregates of varying specific gravities are used, as indicated in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition.

401-3.4 Reclaimed asphalt pavement (RAP). RAP shall not be used.

401-3.5 Control Strip. Full production shall not begin until an acceptable control strip has been constructed and accepted in writing by the RPR**.** The Contractor shall prepare and place a quantity of asphalt according to the JMF. The underlying grade or pavement structure upon which the control strip is to be constructed shall be the same as the remainder of the course represented by the control strip.

The Contractor will not be allowed to place the control strip until the Contractor quality control program (CQCP), showing conformance with the requirements of paragraph 401-5.1, has been accepted, in writing, by the RPR.

The control strip will consist of at least 250 tons or 1/2 sublot, whichever is greater. The control strip shall be placed in two lanes of the same width and depth to be used in production with a longitudinal cold joint. The cold joint must be cut back in accordance with paragraph 401-4.14 using the same procedure that will be used during production. The cold joint for the control strip will be an exposed construction joint at least four (4) hours old or when the mat has cooled to less than 160°F. The equipment used in construction of the control strip shall be the same type, configuration and weight to be used on the project.

The control strip will be considered acceptable by the RPR if the gradation, asphalt content, and VMA are within the action limits specified in paragraph 401-5.5a; and Mat density greater than or equal to 94.5%, air voids 3.5% +/- 1%, and joint density greater than or equal to 92.5%.

If the control strip is unacceptable, necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made and another control strip shall be placed. Unacceptable control strips shall be removed at the Contractor's expense.

The control strip will be considered one lot for payment based upon the average of a minimum of 3 samples (no sublots required for control strip). Payment will only be made for an acceptable control strip in accordance with paragraph 401-8.1 using a lot pay factor equal to 100.

CONSTRUCTION METHODS

401-4.1 Weather limitations. The asphalt shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 4. The temperature requirements may be waived by the RPR, if requested; however, all other requirements including compaction shall be met.

Table 4. Surface Temperature Limitations of Underlying Course

Mat Thickness	Base Temperature (Minimum)	
	°F	°C
3 inches or greater	40	4
Greater than 2 inches but less than 3 inches	45	7

401-4.2 Asphalt plant. Plants used for the preparation of asphalt shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M156 including the following items.

a. Inspection of plant. The RPR, or RPR's authorized representative, shall have access, at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying weights, proportions, and material properties; and checking the temperatures maintained in the preparation of the mixtures.

b. Storage bins and surge bins. The asphalt mixture stored in storage and/or surge bins shall meet the same requirements as asphalt mixture loaded directly into trucks. Asphalt mixture shall not be stored in storage and/or surge bins for a period greater than twelve (12) hours. If the RPR determines there is an excessive heat loss, segregation, or oxidation of the asphalt mixture due to temporary storage, temporary storage shall not be allowed.

401-4.3 Aggregate stockpile management. Aggregate stockpiles shall be constructed in a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the asphalt batch plant. Aggregates that have become segregated or mixed with earth or foreign material shall not be used.

A continuous supply of materials shall be provided to the work to ensure continuous placement.

401-4.4 Hauling equipment. Trucks used for hauling asphalt shall have tight, clean, and smooth metal beds. To prevent the asphalt from sticking to the truck beds, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other material approved by the RPR. Petroleum products shall not be used for coating truck beds. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

401-4.4.1 Material transfer vehicle (MTV). Material transfer vehicles used to transfer the material from the hauling equipment to the paver, shall use a self-propelled, material transfer vehicle with a swing conveyor that can deliver material to the paver without making contact with the paver. The MTV shall be able to move back and forth between the hauling equipment and the paver providing material transfer to the paver, while allowing the paver to operate at a constant speed. The Material Transfer Vehicle will have remixing and storage capability to prevent physical and thermal segregation.

401-4.5 Asphalt pavers. Asphalt pavers shall be self-propelled with an activated heated screed, capable of spreading and finishing courses of asphalt that will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface. The asphalt paver shall be equipped with a control system capable of automatically maintaining the specified screed grade and elevation.

If the spreading and finishing equipment in use leaves tracks or indented areas, or produces other blemishes in the pavement that are not satisfactorily corrected by the scheduled operations, the use of such equipment shall be discontinued.

The paver shall be capable of paving to a minimum width specified in paragraph 401-4.12.

401-4.6 Rollers. The number, type, and weight of rollers shall be sufficient to compact the asphalt to the required density while it is still in a workable condition without crushing of the aggregate, depressions or other damage to the pavement surface. Rollers shall be in good condition, clean, and capable of operating at slow speeds to avoid displacement of the asphalt. All rollers shall be specifically designed and suitable for compacting asphalt concrete and shall be properly used. Rollers that impair the stability of any layer of a pavement structure or underlying soils shall not be used.

401-4.7 Density device. The Contractor shall have on site a density gauge during all paving operations in order to assist in the determination of the optimum rolling pattern, type of roller and frequencies, as well as to monitor the effect of the rolling operations during production paving. The Contractor shall supply a qualified technician during all paving operations to calibrate the gauge and obtain accurate density readings for all new asphalt. These densities shall be supplied to the RPR upon request at any time during construction. No separate payment will be made for supplying the density gauge and technician.

401-4.8 Preparation of asphalt binder. The asphalt binder shall be heated in a manner that will avoid local overheating and provide a continuous supply of the asphalt binder to the mixer at a uniform temperature. The temperature of unmodified asphalt binder delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 325°F

when added to the aggregate. The temperature of modified asphalt binder shall be no more than 350°F when added to the aggregate.

401-4.9 Preparation of mineral aggregate. The aggregate for the asphalt shall be heated and dried. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350°F when the asphalt binder is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

401-4.10 Preparation of Asphalt mixture. The aggregates and the asphalt binder shall be weighed or metered and mixed in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but not less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor, based on the procedure for determining the percentage of coated particles described in ASTM D2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to achieve 95% of coated particles. For continuous mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the mixer. The moisture content of all asphalt upon discharge shall not exceed 0.5%.

401-4.11 Application of Prime and Tack Coat. Immediately before placing the asphalt mixture (prime coat is not required), the underlying course shall be cleaned of all dust and debris.

A tack coat shall be applied in accordance with Item P-603 to all vertical and horizontal asphalt and concrete surfaces prior to placement of the first and each subsequent lift of asphalt mixture.

401-4.12 Laydown plan, transporting, placing, and finishing. Prior to the placement of the asphalt, the Contractor shall prepare a laydown plan with the sequence of paving lanes and width to minimize the number of cold joints; the location of any temporary ramps; laydown temperature; and estimated time of completion for each portion of the work (milling, paving, rolling, cooling, etc.). The laydown plan and any modifications shall be approved by the RPR.

Deliveries shall be scheduled so that placing and compacting of asphalt is uniform with minimum stopping and starting of the paver. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to approximately ambient temperature. The Contractor, at their expense, shall be responsible for repair of any damage to the pavement caused by hauling operations.

Contractor shall survey each lift of asphalt surface course and certify to RPR that every lot of each lift meets the grade tolerances of paragraph 401-6.2d before the next lift can be placed.

Edges of existing asphalt pavement abutting the new work shall be saw cut and the cut off material and laitance removed. Apply a tack coat in accordance with P-603 before new asphalt material is placed against it.

The speed of the paver shall be regulated to eliminate pulling and tearing of the asphalt mat. Placement of the asphalt mix shall begin along the centerline of a crowned section or on the high side of areas with a one way slope unless shown otherwise on the laydown plan as accepted by the RPR. The asphalt mix shall be placed in consecutive adjacent lanes having a minimum width of **16.33** feet except where edge lanes require less width to complete the area. Additional screed sections attached to widen the paver to meet the minimum lane width requirements must include additional auger sections to move the asphalt mixture uniformly along the screed extension.

The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least one foot; however, the joint in the surface top course shall be at the centerline of crowned pavements. Transverse joints in one course shall be offset by at least 10 feet from transverse joints in the previous course. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet. On areas where

irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the asphalt may be spread and luted by hand tools.

The RPR may at any time, reject any batch of asphalt, on the truck or placed in the mat, which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or overheated asphalt mixture. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the RPR, and if it can be demonstrated in the laboratory, in the presence of the RPR, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

Areas of segregation in the surface course, as determined by the RPR, shall be removed and replaced at the Contractor's expense. The area shall be removed by saw cutting and milling a minimum of the construction lift thickness as specified in paragraph 401-3.3, Table 2 for the approved mix design. The area to be removed and replaced shall be a minimum width of the paver and a minimum of 10 feet long.

401-4.13 Compaction of asphalt mixture. After placing, the asphalt mixture shall be thoroughly and uniformly compacted by self-propelled rollers. The surface shall be compacted as soon as possible when the asphalt has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any surface defects and/or displacement occurring as a result of the roller, or from any other cause, shall be corrected at the Contractor's expense.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross-section, and the required field density is obtained. To prevent adhesion of the asphalt to the roller, the wheels shall be equipped with a scraper and kept moistened with water as necessary.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with approved power tampers.

Any asphalt that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.

401-4.14 Joints. The formation of all joints shall be made to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

The roller shall not pass over the unprotected end of the freshly laid asphalt except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. In both methods, all contact surfaces shall be coated with an asphalt tack coat before placing any fresh asphalt against the joint.

Longitudinal joints which have been left exposed for more than four (4) hours; the surface temperature has cooled to less than 175°F; or are irregular, damaged, uncompacted or otherwise defective shall be cut back with a cutting wheel or pavement saw a maximum of 3 inches to expose a clean, sound, uniform vertical surface for the full depth of the course. All cutback material and any laitance produced from cutting joints shall be removed from the project. Asphalt tack coat in accordance with P-603 shall be applied to the clean, dry joint prior to placing any additional fresh asphalt against the joint. The cost of this work shall be considered incidental to the cost of the asphalt.

401-4.15 Saw-cut grooving. Saw-cut grooves shall be provided as specified in Item P-621.

401-4.16 Diamond grinding. Diamond grinding shall be completed prior to pavement grooving. Diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive.

Diamond grinding shall be performed with a machine designed specifically for diamond grinding capable of cutting a path at least 3 feet wide. The saw blades shall be 1/8-inch wide with a sufficient number of blades to create grooves between 0.090 and 0.130 inches wide; and peaks and ridges approximately 1/32 inch higher than the bottom of the grinding cut. The actual number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Equipment or grinding procedures that cause ravels, aggregate fractures, spalls or disturbance to the pavement will not be permitted. Contractor shall demonstrate to the RPR that the grinding equipment will produce satisfactory results prior to making corrections to surfaces. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The slurry resulting from the grinding operation shall be continuously removed and the pavement left in a clean condition. The Contractor shall apply a surface treatment per P-608 to all areas that have been subject to grinding.

401-4.17 Nighttime paving requirements. The Contractor shall provide adequate lighting during any nighttime construction. A lighting plan shall be submitted by the Contractor and approved by the RPR prior to the start of any nighttime work. All work shall be in accordance with the approved CSPP and lighting plan.

CONTRACTOR QUALITY CONTROL (CQC)

401-5.1 General. The Contractor shall develop a Contractor Quality Control Program (CQCP) in accordance with Item C-100. No partial payment will be made for materials without an approved CQCP.

401-5.2 Contractor quality control (QC) facilities. The Contractor shall provide or contract for testing facilities in accordance with Item C-100. The RPR shall be permitted unrestricted access to inspect the Contractor's QC facilities and witness QC activities. The RPR will advise the Contractor in writing of any noted deficiencies concerning the QC facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

401-5.3 Contractor QC testing. The Contractor shall perform all QC tests necessary to control the production and construction processes applicable to these specifications and as set forth in the approved CQCP. The testing program shall include, but not necessarily be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. A QC Testing Plan shall be developed as part of the CQCP.

a. Asphalt content. A minimum of two tests shall be performed per day in accordance with ASTM D6307 or ASTM D2172 for determination of asphalt content. When using ASTM D6307, the correction factor shall be determined as part of the first test performed at the beginning of plant production; and as part of every tenth test performed thereafter. The asphalt content for the day will be determined by averaging the test results.

b. Gradation. Aggregate gradations shall be determined a minimum of twice per day from mechanical analysis of extracted aggregate in accordance with ASTM D5444, ASTM C136, and ASTM C117.

c. Moisture content of aggregate. The moisture content of aggregate used for production shall be determined a minimum of once per day in accordance with ASTM C566.

d. Moisture content of asphalt. The moisture content shall be determined once per day in accordance with AASHTO T329 or ASTM D1461.

e. Temperatures. Temperatures shall be checked, at least four times per day, at necessary locations to determine the temperatures of the dryer, the asphalt binder in the storage tank, the asphalt at the plant, and the asphalt at the job site.

f. In-place density monitoring. The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D2950.

g. Smoothness for Contractor Quality Control.

The Contractor shall perform smoothness testing in transverse and longitudinal directions daily to verify that the construction processes are producing pavement with variances less than ¼ inch in 12 feet, identifying areas that may pond water which could lead to hydroplaning of aircraft. If the smoothness criteria is not met, appropriate changes and corrections to the construction process shall be made by the Contractor before construction continues.

The Contractor may use a 12-foot straightedge, a rolling inclinometer meeting the requirements of ASTM E2133 or rolling external reference device that can simulate a 12-foot straightedge approved by the RPR. Straight-edge testing shall start with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Testing shall be continuous across all joints. The surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between the two high points. If the rolling inclinometer or external reference device is used, the data may be evaluated using the FAA profile program, ProFAA, or FHWA ProVal, using the 12-foot straightedge simulation function.

Smoothness readings shall not be made across grade changes or cross slope transitions. The transition between new and existing pavement shall be evaluated separately for conformance with the plans.

(1) Transverse measurements. Transverse measurements shall be taken for each day's production placed. Transverse measurements shall be taken perpendicular to the pavement centerline each 50 feet or more often as determined by the RPR. The joint between lanes shall be tested separately to facilitate smoothness between lanes.

(2) Longitudinal measurements. Longitudinal measurements shall be taken for each day's production placed. Longitudinal tests shall be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet; and at the third points of paving lanes when widths of paving lanes are 20 ft or greater. When placement abuts previously placed material the first measurement shall start with one half the length of the straight edge on the previously placed material.

Deviations on the final surface course in either the transverse or longitudinal direction that will trap water greater than 1/4 inch shall be corrected with diamond grinding per paragraph 401-4.16 or by removing and replacing the surface course to full depth. Grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. All areas in which diamond grinding has been performed shall be subject to the final pavement thickness tolerances specified in paragraph 401-6.1d(3). Areas that have been ground shall be sealed with a surface treatment in accordance with Item P-608. To avoid the surface treatment creating any conflict with runway or taxiway markings, it may be necessary to seal a larger area.

Control charts shall be kept to show the area of each day's placement and the percentage of corrective grinding required. Corrections to production and placement shall be initiated when corrective grinding is required. If the Contractor's machines and/or methods produce significant areas that need corrective actions in excess of 10 percent of a day's production, production shall be stopped until corrective measures are implemented by the Contractor.

h. Grade. Grade shall be evaluated daily to allow adjustments to paving operations when grade measurements do not meet specifications. As a minimum, grade shall be evaluated prior to and after the placement of the first lift and after placement of the surface lift.

Measurements will be taken at appropriate gradelines (as a minimum at center and edges of paving lane) and longitudinal spacing as shown on cross-sections and plans. The final surface of the pavement will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch vertically. The documentation will be provided by the Contractor to the RPR within 24 hours.

Areas with humps or depressions that exceed grade or smoothness criteria and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2 inch less than the thickness specified on the plans. Grinding shall be in accordance with paragraph 401-4.16.

The Contractor shall repair low areas or areas that cannot be corrected by grinding by removal of deficient areas to the depth of the final course plus ½ inch and replacing with new material. Skin patching is not allowed.

401-5.4 Sampling. When directed by the RPR, the Contractor shall sample and test any material that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

401-5.5 Control charts. The Contractor shall maintain linear control charts for both individual measurements and range (i.e. difference between highest and lowest measurements) for aggregate gradation, asphalt content, and VMA. The VMA for each day will be calculated and monitored by the QC laboratory.

Control charts shall be posted in a location satisfactory to the RPR and kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the RPR may suspend production or acceptance of the material.

a. Individual measurements. Control charts for individual measurements shall be established to maintain process control within tolerance for aggregate gradation, asphalt content, and VMA. The control charts shall use the job mix formula target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

Control Chart Limits for Individual Measurements

Sieve	Action Limit	Suspension Limit
3/4 inch (19.0 mm)	±6%	±9%
1/2 inch (12.5 mm)	±6%	±9%
3/8 inch (9.5 mm)	±6%	±9%
No. 4 (4.75 mm)	±6%	±9%
No. 16 (1.18 mm)	±5%	±7.5%
No. 50 (300 µm)	±3%	±4.5%
No. 200 (75 µm)	±2%	±3%
Asphalt Content	±0.45%	±0.70%
Minimum VMA	-0.5%	-1.0%

b. Range. Control charts shall be established to control gradation process variability. The range shall be plotted as the difference between the two test results for each control parameter. The Suspension Limits specified below are based on a sample size of n = 2. Should the Contractor elect to perform more than two tests per lot, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for n = 3 and by 1.27 for n = 4.

Control Chart Limits Based on Range

Sieve	Suspension Limit
1/2 inch	11%
3/8 inch	11%
No. 4	11%
No. 16	9%
No. 50	6%
No. 200	3.5%
Asphalt Content	0.8%

c. Corrective Action. The CQCP shall indicate that appropriate action shall be taken when the process is believed to be out of tolerance. The Plan shall contain rules to gauge when a process is out of control and detail what action will be taken to bring the process into control. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

(1) One point falls outside the Suspension Limit line for individual measurements or range; or

(2) Two points in a row fall outside the Action Limit line for individual measurements.

401-5.6 QC reports. The Contractor shall maintain records and shall submit reports of QC activities daily, in accordance with Item C-100.

MATERIAL ACCEPTANCE

401-6.1 Acceptance sampling and testing. Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the RPR at no cost to the Contractor except that coring as required in this section shall be completed and paid for by the Contractor.

a. Quality assurance (QA) testing laboratory. The QA testing laboratory performing these acceptance tests will be accredited in accordance with ASTM D3666. The QA laboratory accreditation will be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing will be listed on the lab accreditation.

b. Lot size. A standard lot will be equal to one day's production divided into approximately equal sublots of between 400 to 600 tons. When only one or two sublots are produced in a day's production, the sublots will be combined with the production lot from the previous or next day.

Where more than one plant is simultaneously producing asphalt for the job, the lot sizes will apply separately for each plant.

c. Asphalt air voids. Plant-produced asphalt will be tested for air voids on a sublot basis.

(1) Sampling. Material from each sublot shall be sampled in accordance with ASTM D3665. Samples shall be taken from material deposited into trucks at the plant or at the job site in accordance with ASTM D979. The sample of asphalt may be put in a covered metal tin and placed in an oven for not less than 30 minutes nor more than 60 minutes **(for non-absorbtive aggregates)** to maintain the material at or above the compaction temperature as specified in the JMF.

(2) Testing. Air voids will be determined for each sublot in accordance with ASTM D3203 for a set of three compacted specimens prepared in accordance with ASTM D6926.

d. In-place asphalt mat and joint density. Each sublot will be tested for in-place mat and joint density as a percentage of the theoretical maximum density (TMD).

(1) Sampling. The Contractor will cut minimum 5 inch diameter samples in accordance with ASTM D5361. The Contractor shall furnish all tools, labor, and materials for cleaning, and filling the cored

pavement. Laitance produced by the coring operation shall be removed immediately after coring, and core holes shall be filled within one day after sampling in a manner acceptable to the RPR.

(2) Bond. Each lift of asphalt shall be bonded to the underlying layer. If cores reveal that the surface is not bonded, additional cores shall be taken as directed by the RPR to determine the extent of unbonded areas. Unbonded areas shall be removed by milling and replaced at no additional cost as directed by the RPR.

(3) Thickness. Thickness of each lift of surface course will be evaluated by the RPR for compliance to the requirements shown on the plans after any necessary corrections for grade. Measurements of thickness will be made using the cores extracted for each sublot for density measurement. The maximum allowable deficiency at any point will not be more than 1/4 inch less than the thickness indicated for the lift. Average thickness of lift, or combined lifts, will not be less than the indicated thickness. Where the thickness tolerances are not met, the lot or sublot shall be corrected by the Contractor at his expense by removing the deficient area and replacing with new pavement. The Contractor, at his expense, may take additional cores as approved by the RPR to circumscribe the deficient area.

(4) Mat density. One core shall be taken from each sublot. Core locations will be determined by the RPR in accordance with ASTM D3665. Cores for mat density shall not be taken closer than one foot from a transverse or longitudinal joint. The bulk specific gravity of each cored sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each sublot sample by the TMD for that sublot.

(5) Joint density. One core centered over the longitudinal joint shall be taken for each sublot that has a longitudinal joint. Core locations will be determined by the RPR in accordance with ASTM D3665. The bulk specific gravity of each core sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each joint density sample by the average TMD for the lot. The TMD used to determine the joint density at joints formed between lots will be the lower of the average TMD values from the adjacent lots.

401-6.2 Acceptance criteria.

a. General. Acceptance will be based on the implementation of the Contractor Quality Control Program (CQCP) and the following characteristics of the asphalt and completed pavements: air voids, mat density, joint density, grade and Profilograph roughness**.**

b. Air Voids and Mat density. Acceptance of each lot of plant produced material for mat density and air voids will be based on the percentage of material within specification limits (PWL). If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment will be determined in accordance with paragraph 401-8.1.

c. Joint density. Acceptance of each lot of plant produced asphalt for joint density will be based on the PWL. If the PWL of the lot is equal to or exceeds 90%, the lot will be considered acceptable. If the PWL is less than 90%, the Contractor shall evaluate the reason and act accordingly. If the PWL is less than 80%, the Contractor shall cease operations and until the reason for poor compaction has been determined. If the PWL is less than 71%, the pay factor for the lot used to complete the joint will be reduced by five (5) percentage points. This lot pay factor reduction will be incorporated and evaluated in accordance with paragraph 401-8.1.

d. Grade. The final finished surface of the pavement shall be surveyed to verify that the grade elevations and cross-sections shown on the plans do not deviate more than 1/2 inch vertically.

Cross-sections of the pavement shall be taken at a minimum 50-foot longitudinal spacing, at all longitudinal grade breaks, and at start and end of each lane placed. Minimum cross-section grade points shall include grade at centerline, ± 10 feet of centerline, edge of runway, and edge of taxiway pavement.

The survey and documentation shall be stamped and signed by a licensed surveyor. Payment for sublots that do not meet grade for over 25% of the sublot shall not be more than 95%.

e. Profilograph roughness for QA Acceptance. The final profilograph shall be the full length of the project to facilitate testing of roughness between lots. The Contractor, in the presence of the RPR shall perform a profilograph roughness test on the completed project with a profilograph meeting the

requirements of ASTM E1274 or a Class I inertial profiler meeting ASTM E950. Data and results shall be provided within 48 hours of profilograph roughness tests.

The pavement shall have an average profile index less than 15 inches per mile per 1/10 mile. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate “must grind” bumps and the Profile Index for the pavement using a 0.2-inch blanking band. The bump template must span one inch with an offset of 0.4 inches. The profilograph must be calibrated prior to use and operated by a factory or State DOT approved, trained operator. Profilograms shall be recorded on a longitudinal scale of one inch equals 25 feet and a vertical scale of one inch equals one inch. Profilograph shall be performed one foot right and left of project centerline and 15 feet right and left of project centerline. Any areas that indicate “must grind” shall be corrected with diamond grinding per paragraph 401-4.16 or by removing and replacing full depth of surface course. as directed by the RPR. Where corrections are necessary, a second profilograph run shall be performed to verify that the corrections produced an average profile index of 15 inches per mile per 1/10 mile or less.

401-6.3 Percentage of material within specification limits (PWL). The PWL will be determined in accordance with procedures specified in Item C-110. The specification tolerance limits (L) for lower and (U) for upper are contained in Table 5.

Table 5. Acceptance Limits for Air Voids and Density

Test Property	Pavements Specification Tolerance Limits	
	L	**U**
Air Voids Total Mix (%)	2.0	5.0
Surface Course Mat Density (%)	92.8	**-**
Joint density (%)	90.5	--

a. Outliers. All individual tests for mat density and air voids will be checked for outliers (test criterion) in accordance with ASTM E178, at a significance level of 5%. Outliers will be discarded, and the PWL will be determined using the remaining test values. The criteria in Table 5 is based on production processes which have a variability with the following standard deviations: Surface Course Mat Density (%), 1.30; Base Course Mat Density (%), 1.55; Joint Density (%), 1.55.

The Contractor should note that (1) 90 PWL is achieved when consistently producing a surface course with an average mat density of at least 94.5% with 1.30% or less variability, (2) 90 PWL is achieved when consistently producing a base course with an average mat density of at least 94.0% with 1.55% or less variability, and (3) 90 PWL is achieved when consistently producing joints with an average joint density of at least 92.5% with 1.55% or less variability.

401-6.4 Resampling pavement for mat density.

a. General. Resampling of a lot of pavement will only be allowed for mat density, and then, only if the Contractor requests same, in writing, within 48 hours after receiving the written test results from the RPR. A retest will consist of all the sampling and testing procedures contained in paragraphs 401-6.1d and 401-6.2b. Only one resampling per lot will be permitted.

(1) A redefined PWL will be calculated for the resampled lot. The number of tests used to calculate the redefined PWL will include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

b. Payment for resampled lots. The redefined PWL for a resampled lot will be used to calculate the payment for that lot in accordance with Table 6.

c. Outliers. Check for outliers in accordance with ASTM E178, at a significance level of 5%.

401-6.5 Leveling course. The leveling course is the first variable thickness lift placed to correct surface irregularities prior to placement of subsequent courses. The leveling course shall meet the aggregate gradation in Table 2, paragraph 401-3.3. The leveling course shall meet the requirements of paragraph 401-3.3, 401-6.2b for air voids, but shall not be subject to the density requirements of paragraph 401-6.2b for mat density and 401-6.2c for joint density. The leveling course shall be compacted with the same effort used to achieve density of the control strip. The leveling course shall not exceed the maximum lift thickness associated with each gradation in Table 2, paragraph 401-3.3.

METHOD OF MEASUREMENT

401-7.1 Measurement. Asphalt shall be measured by the number of tons of asphalt used in the accepted work. Batch weights or truck scale weights will be used to determine the basis for the tonnage. All P-401 placed shall be measured as Surface Course.

BASIS OF PAYMENT

401-8.1 Payment. Payment for a lot of asphalt meeting all acceptance criteria as specified in paragraph 401-6.2 shall be made based on results of tests for mat density and air voids. Payment for acceptable lots shall be adjusted according to paragraph 401-8.1c for mat density and air voids; and paragraph 401-6.2c for joint density, subject to the limitation that:

a. The total project payment for plant mix asphalt pavement shall not exceed **100** percent of the product of the contract unit price and the total number of tons of asphalt used in the accepted work.

b. The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

c. Basis of adjusted payment. The pay factor for each individual lot shall be calculated in accordance with Table 6. A pay factor shall be calculated for both mat density and air voids. The lot pay factor shall be the higher of the two values when calculations for both mat density and air voids are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either mat density or air voids is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both mat density and air voids are less than 100%. If PWL for joint density is less than 71% then the lot pay factor shall be reduced by 5% but be no higher than 95%.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 401-8.1a. Payment in excess of 100% for accepted lots of asphalt shall be used to offset payment for accepted lots of asphalt pavement that achieve a lot pay factor less than 100%.

Payment for sublots which do not meet grade in accordance with paragraph 401-6.2d after correction for over 25% of the sublot shall be reduced by 5%.

Table 6. Price adjustment schedule[1]

Percentage of material within specification limits (PWL)	Lot pay factor (percent of contract unit price)
96 – 100	106
90 – 95	PWL + 10
75 – 89	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject [2]

[1] Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment above 100% shall be subject to the total project payment limitation specified in paragraph 401-8.1a.

[2] The lot shall be removed and replaced. However, the RPR may decide to allow the rejected lot to remain. In that case, if the RPR and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50% of the contract unit price and the total project payment shall be reduced by the amount withheld for the rejected lot.

d. Profilograph Roughness. The Contractor will receive full payment when the profilograph average profile index is in accordance with paragraph 401-6.2e. When the final average profile index for the entire length of pavement does not exceed 15 inches per mile per 1/10 mile, payment will be made at the contract unit price for the completed pavement.

401-8.1 Payment.

Payment will be made under:

Item P-401-8.1	Asphalt Surface Course, P-401 - per ton

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C29	Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D242	Standard Specification for Mineral Filler for Bituminous Paving Mixtures

ASTM D946	Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D979	Standard Practice for Sampling Asphalt Paving Mixtures
ASTM D1073	Standard Specification for Fine Aggregate for Asphalt Paving Mixtures
ASTM D1188	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
ASTM D2172	Standard Test Method for Quantitative Extraction of Bitumen from Asphalt Paving Mixtures
ASTM D1461	Standard Test Method for Moisture or Volatile Distillates in Asphalt Paving Mixtures
ASTM D2041	Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2489	Standard Practice for Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D2726	Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D2950	Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
ASTM D3203	Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D3381	Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4552	Standard Practice for Classifying Hot-Mix Recycling Agents
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D4867	Standard Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D5361	Standard Practice for Sampling Compacted Asphalt Mixtures for Laboratory Testing
ASTM D5444	Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6084	Standard Test Method for Elastic Recovery of Bituminous Materials by Ductilometer
ASTM D6307	Standard Test Method for Asphalt Content of Hot Mix Asphalt by Ignition Method

ASTM D6373	Standard Specification for Performance Graded Asphalt Binder
ASTM D6752	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method
ASTM D6926	Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus
ASTM D6927	Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures
ASTM D6995	Standard Test Method for Determining Field VMA based on the Maximum Specific Gravity of the Mix (Gmm)
ASTM E11	Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph
ASTM E950	Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference
ASTM E2133	Standard Test Method for Using a Rolling Inclinometer to Measure Longitudinal and Transverse Profiles of a Traveled Surface

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M156	Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
AASHTO T329	Standard Method of Test for Moisture Content of Hot Mix Asphalt (HMA) by Oven Method
AASHTO T324	Standard Method of Test for Hamburg Wheel-Track Testing of Compacted Asphalt Mixtures
AASHTO T 340	Standard Method of Test for Determining the Rutting Susceptibility of Hot Mix Asphalt (APA) Using the Asphalt Pavement Analyzer (APA)

Asphalt Institute (AI)

Asphalt Institute Handbook MS-26, Asphalt Binder

Asphalt Institute MS-2 Mix Design Manual, 7th Edition

AI State Binder Specification Database

Federal Highway Administration (FHWA)

Long Term Pavement Performance Binder Program

Advisory Circulars (AC)

AC 150/5320-6	Airport Pavement Design and Evaluation

FAA Orders

5300.1	Modifications to Agency Airport Design, Construction, and Equipment Standards

Software

FAARFIELD

END OF ITEM P-401

Item P-608 Emulsified Asphalt Seal Coat

DESCRIPTION

608-1.1 This item shall consist of the application of a emulsified asphalt surface treatment composed of an emulsion of natural and refined asphalt materials, water and a polymer additive, for taxiways and runways with the application of a suitable aggregate to maintain adequate surface friction; and airfield secondary and tertiary pavements including low-speed taxiways, shoulders, overruns, roads, parking areas, and other general applications with or without aggregate applied as designated on the plans. The terms seal coat, asphalt sealer, and asphalt material are interchangeable throughout this specification. The term emulsified asphalt means an emulsion of natural and refined asphalt materials.

MATERIALS

608-2.1 Aggregate. Not required.

608-2.2 Asphalt Emulsion. The asphalt emulsion shall meet the properties in the following table:

Concentrated Asphalt Emulsion Properties

Properties	Specification	Limits
Viscosity, Saybolt Furol at 77°F	ASTM D7496	20 – 100 seconds
Residue by Distillation or Evaporation	ASTM D6997 or ASTM D6934	57% minimum
Sieve Test	ASTM D6933	0.1% maximum
24-hour Stability	ASTM D6930	1% maximum
5-day Settlement Test	ASTM D6930	5.0% maximum
Particle Charge [1]	ASTM D7402	Positive 6.5 maximum pH

[1] pH may be used in lieu of the particle charge test which is sometimes inconclusive in slow setting, asphalt emulsions.

The asphalt material base residue shall contain not less than 20% gilsonite, or uintaite and shall not contain any tall oil pitch or coal tar material and shall contain no less than one percent (1%) polymer.

Tests on Residue from Distillation or Evaporation

Properties	Specification	Limits
Viscosity at 275°F	ASTM D4402	1750 cts maximum
Solubility in 1, 1, 1 trichloroethylene	ASTM D2042	97.5% minimum
Penetration	ASTM D5	50 dmm maximum
Asphaltenes	ASTM D2007	15% minimum
Saturates	ASTM D2007	15% maximum
Polar Compounds	ASTM D2007	25% minimum
Aromatics	ASTM D2007	15% minimum

The asphalt emulsion, when diluted in the volumetric proportion of one part concentrated asphalt material to one part hot water shall have the following properties:

One-to-One Dilution Emulsion Properties

Properties	Specification	Limits
In Ready-to-Apply Form, one part concentrate to one part water, by volume		
Viscosity, Saybolt Furol at 77°F	ASTM D7496	5 – 50 seconds
Residue by Distillation or Evaporation	ASTM D6997 or ASTM D6934	28.5% minimum
Pumping Stability [1]		Pass

[1] Pumping stability is tested by pumping one pint of seal coat diluted one (1) part concentrate to one (1) part water, at 77°F, through a 1/4-inch gear pump operating 1750 rpm for 10 minutes with no significant separation or coagulation.

The Contractor shall provide a copy of the manufacturer's Certificate of Analysis (COA) for the emulsified asphalt delivered to the project. If the asphalt emulsion is diluted at other than the manufacturer's facility, the Contractor shall provide a supplemental COA from an independent laboratory verifying the asphalt emulsion properties.

The COA shall be provided to and approved by the RPR before the emulsified asphalt is applied. The furnishing of the vendor's certified test report for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project.

The asphalt material storage and handling temperature shall be between 50°F - 160°F and the material shall be protected from freezing, or whenever outside temperature drops below 40°F for prolonged time periods.

Contractor shall provide a list of airport pavement projects, exposed to similar climate conditions, where this product has been successfully applied within at least 5 years of the project.

608-2.3 Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use. Water used in making and diluting the emulsion shall be potable, with a maximum hardness of 90ppm calcium and 15ppm magnesium; deleterious iron, sulfates, and phosphates maximum 7ppm, and less than 1ppm of organic byproducts. Water shall be a minimum of 140°F prior to adding to emulsion.

608-2.4 Polymer. The polymer shall meet the properties in the following table:

Polymer Properties

Properties	Limits
Solids Content	47% to 65%, Percent by Weight
Weight	8.0 to 9.0 pounds/gallon
pH	3.0 to 8.0
Particle Charge	Nonionic/Cationic
Mechanical Stability	Excellent
Film Forming Temperature, °C	+5°C, minimum
Tg, °C	22°C, maximum

The manufacturer shall provide a copy of the Certificate of Analysis (COA) for the polymer used in the seal coat; and the Contractor shall include the COA with the emulsified asphalt COA when submitting to the RPR.

608-2.5 Seal Coat with Aggregate. Not used.

COMPOSITION AND APPLICATION RATE

608-3.1 Application Rate. The approximate amounts of materials per square yard for the asphalt surface treatment shall be as provided in the table for the treatment area(s) at the specified dilution rate(s) as noted on the plans. The actual application rates will vary within the range specified to suit field conditions and will be recommended by the manufacturer's representative and approved by the RPR from the test area/sections evaluation.

Application Rate

Dilution Rate	Quantity of Emulsion gal/yd^2	Quantity of Aggregate lb/yd^2
1:1	0.10-0.17	N/A

608-3.2 Control areas and control strips. Prior to full application, the control strip must be accepted by the RPR. The surface preparation, personnel, equipment, and method of operation used on the test area(s) and control strip(s) shall be the same as used on the remainder of the work.

A qualified manufacturer's representative shall be present in the field to assist the Contractor in applying control areas and/or control strips to determine the appropriate application rate of emulsion to be approved by the RPR.

A test area(s) and control strip(s) shall be applied for each differing asphalt pavement surface identified in the project. The test area(s) and control strip(s) shall be used to determine the material application rate(s) of both emulsion and sand prior to full production.

a. For taxiway, taxilane and apron surfaces. Prior to full application, the Contractor shall place test areas at varying application rates as recommended by the Contractor's manufacturer's representative to determine appropriate application rate(s). The test areas will be located on representative section(s) of the pavement to receive the asphalt surface treatment designated by the RPR.

b. For runway and high-speed exit taxiway surfaces. Prior to full application, the Contractor shall place a series of control strips a minimum of 300 feet long by 12 feet wide, or width of anticipated application, whichever is greater, at varying application rates as recommended by the manufacturer's representative and acceptable to the RPR to determine appropriate application rate(s). The control strips should be separated by a minimum of 200 feet between control strips. The area to be tested will be located on a representative section of the pavement to receive the asphalt surface treatment designated by the RPR. The control strips should be placed under similar field conditions as anticipated for the actual application. The skid resistance of the existing pavement shall be determined for each control strip with a continuous friction measuring equipment (CFME). The skid resistance of existing pavement can be immediately adjacent to the control strip or at the same location as the control strip if testing prior to application. The Contractor may begin testing the skid resistance of runway and high-speed exit taxiway control strips after application of the asphalt surface treatment has fully cured, generally 8 to 36 hours after application of the control strips depending on site and environmental conditions. Aircraft shall not be permitted on the runway or high speed exit taxiway control strips until such time as the Contractor validates that its surface friction meets the maintenance planning friction levels in AC 150/5320-12, Table 3-2 when tested at speeds of 40 and 60 mph wet with approved CFME.

If the control strip should prove to be unsatisfactory, necessary adjustments to the application rate, placement operations, and equipment shall be made. Additional control strips shall be placed and additional skid resistance tests performed and evaluated. Full production shall not begin without the RPR's approval of an appropriate application rate(s). Acceptable control strips shall be paid for in accordance with paragraph 608-8.1.

CONSTRUCTION METHODS

608-4.1 Worker safety. The Contractor shall obtain a Safety Data Sheet (SDS) for both the asphalt emulsion product and sand and require workmen to follow the manufacturer's recommended safety precautions.

608-4.2 Weather limitations. The asphalt emulsion shall be applied only when the existing pavement surface is dry and when the weather is not foggy, rainy, or when the wind velocity will prevent the uniform application of the material. No material shall be applied in strong winds that interfere with the uniform application of the material(s), or when dust or sand is blowing or when rain is anticipated within eight (8) hours of application completion. The atmospheric temperature and the pavement surface temperature shall both be at, or above 60°F and rising. Seal coat shall not be applied when pavement temperatures are expected to exceed 130ºF within the subsequent 72 hours if traffic will be opened on pavement within those 72 hours. During application, account for wind drift. Cover existing buildings, structures, runway edge lights, taxiway edge lights, informational signs, retro-reflective marking and in-pavement duct markers as necessary to protect against overspray before applying the emulsion. Should emulsion get on any light or marker fixture, promptly clean the fixture. If cleaning is not satisfactory to the RPR, the Contractor shall replace any light, sign or marker with equivalent equipment at no cost to the Owner.

608-4.3 Equipment and tools. The Contractor shall furnish all equipment, tools, and machinery necessary for the performance of the work.

a. Pressure distributor. The emulsion shall be applied with a manufacturer-approved computer rate-controlled asphalt distributor. The equipment shall be in good working order and contain no contaminants or diluents in the tank. Spray bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the emulsion. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under eight (8) miles per hour or seven hundred (700) feet per minute. The equipment will be tested under pressure for leaks and to ensure proper set-up before use. The Contractor will provide verification of truck set-up (via a test-shot area), including but not limited to, nozzle tip size appropriate for application per nozzle manufacturer, spray-bar height and pressure and pump speed appropriate for the viscosity and temperature of sealer material, evidence of triple-overlap spray pattern, lack of leaks, and any other factors relevant to ensure the truck is in good working order before use.

The distributor truck shall be equipped with a 12-foot, minimum, spray bar with individual nozzle control. The distributor truck shall be capable of specific application rates in the range of 0.05 to 0.25 gallons per square yard. These rates shall be computer-controlled rather than mechanical. The distributor truck shall have an easily accessible thermometer that constantly monitors the temperature of the emulsion, and have an operable mechanical tank gauge that can be used to cross-check the computer accuracy.

The distributor truck shall effectively heat and mix the material to the required temperature prior to application in accordance with the manufacturer's recommendations.

The distributor shall be equipped with a hand sprayer to spray the emulsion in areas not accessible to the distributor truck.

b. Aggregate spreader. Not used.

c. Power broom/blower. A power broom and/or blower shall be provided for removing loose material from the surface to be treated.

d. Equipment calibration. Asphalt distributors must be calibrated within the same construction season in accordance with ASTM D2995. The Contractor must furnish a current calibration certification for the asphalt distributor truck from any State or other agency as approved by the RPR.

608-4.4 Preparation of asphalt pavement surfaces. Clean pavement surface immediately prior to placing the seal coat so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film. Remove oil or grease from the asphalt pavement by scrubbing with a detergent, washing thoroughly with clean water, and then treat these areas with a spot primer. Any additional surface preparation, such as crack repair, shall be in accordance with Item P-101, paragraph 101-3.6.

a. New asphalt pavement surfaces. Allow new asphalt pavement surfaces to cure so that there is no concentration of oils on the surface. A period of at least 30 days at 70°F (21°C) daytime temperatures should elapse between the placement of a hot mixed asphalt concrete surface course and the application of the surface treatment.

Perform a water-break-free test to confirm that the surface oils have degraded and dissipated. (Cast approximately one gallon (4 liters) of clean water out over the surface. The water should sheet out and wet the surface uniformly without crawling or showing oil rings.) If signs of crawling or oil rings are apparent on the pavement surface, additional time must be allowed for additional curing and retesting of the pavement surface prior to treatment.

608-4.5 Emulsion mixing. The application emulsion shall be obtained by blending asphalt material concentrate, water and polymer, if specified. Always add heated water to the asphalt material concentrate, never add asphalt material concentrate to heated water. Mix one part heated water to one part asphalt material concentrate, by volume.

Add 1% polymer, by volume, to the emulsion mix. If the polymer is added to the emulsion mix at the plant, submit weight scale tickets to the RPR. As an option, the polymer may be added to the emulsion mix at the job site provided the polymer is added slowly while the asphalt distributor truck circulating pump is running. The mix must be agitated for a minimum of 15 minutes or until the polymer is mixed to the satisfaction of the RPR.

608-4.6 Application of asphalt emulsion. The asphalt emulsion shall be applied using a pressure distributor upon the properly prepared, clean and dry surface at the application rate recommended by the manufacturer's representative and approved by the RPR from the test area/sections evaluation for each designated treatment area. The asphalt emulsion should be applied at a temperature between 130°Fand 160°F or in accordance with the manufacturer's recommendation.

If low spots and depressions greater than 1/2 inch in depth in the pavement surface cause ponding or puddling of the applied materials, the pavement surface shall be lightly broomed with a broom or brush type squeegee until the pavement surface is free of any pools of excess material.

During all applications, the surfaces of adjacent structures shall be protected to prevent their being spattered or marred.

608-4.7 Application of aggregate material. Not used.

QUALITY CONTROL (QC)

608-5.1 Manufacturer's representation. The manufacturer's representative knowledgable of the material, procedures, and equipment described in the specification is responsible to assist the Contractor and RPR in determining the appropriate application rates of the emulsion, as well as recommendations for proper preparation and start-up of seal coat application. Documentation of the manufacturer representative's experience and knowledge for applying the seal coat product shall be furnished to the RPR a minimum of 10 work days prior to placement of the control strips. The cost of the manufacturer's representative shall be included in the Contractor's bid price.

608-5.2 Contractor qualifications. The Contractor shall provide documentation to the RPR that the seal coat Contractor is qualified to apply the seal coat, including personnel, and equipment, and has made at least three (3) applications similar to this project in the past two (2) years.

MATERIAL ACCEPTANCE

608-6.1 Application rate. The rate of application of the asphalt emulsion shall be verified at least twice per day.

608-6.2 Friction tests. Not used.

METHOD OF MEASUREMENT

608-7.1 Asphalt surface treatment. There will be no separate measurement of asphalt surface treatment as it is only for repair of contractor work.

BASIS OF PAYMENT

608-8.1 There is no separate payment for this item.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D5	Standard Test Method for Penetration of Asphalt Materials
ASTM D244	Standard Test Methods and Practices for Emulsified Asphalts
ASTM D2007	Standard Test Method for Characteristic Groups in Rubber Extender and Processing Oils and Other Petroleum-Derived Oils by the Clay-Gel Absorption Chromatographic Method
ASTM D2042	Standard Test Method for Solubility of Asphalt Materials in Trichloroethylene
ASTM D2995	Standard Practice for Estimating Application Rate of Bituminous Distributors
ASTM D4402	Standard Test Method for Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer
ASTM D5340	Standard Test Method for Airport Pavement Condition Index Surveys

Advisory Circulars (AC)

AC 150/5320-12	Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces
AC 150/5320-17	Airfield Pavement Surface Evaluation and Rating (PASER) Manuals
AC 150/5380-6	Guidelines and Procedures for Maintenance of Airport Pavements

END OF ITEM P-608

Item P-603 Emulsified Asphalt Tack Coat

DESCRIPTION

603-1.1 This item shall consist of preparing and treating an asphalt or concrete surface with asphalt material in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

MATERIALS

603-2.1 Asphalt materials. The asphalt material shall be an emulsified asphalt as specified in ASTM D3628 as an asphalt application for tack coat appropriate to local conditions. The emulsified asphalt shall not be diluted. The Contractor shall provide a copy of the manufacturer's Certificate of Analysis (COA) for the asphalt material to the Resident Project Representative (RPR) before the asphalt material is applied for review and acceptance. The furnishing of COA for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project.

CONSTRUCTION METHODS

603-3.1 Weather limitations. The tack coat shall be applied only when the existing surface is dry and the atmospheric temperature is 50°F or above; the temperature has not been below 35°F for the 12 hours prior to application; and when the weather is not foggy or rainy. The temperature requirements may be waived when directed by the RPR.

603-3.2 Equipment. The Contractor shall provide equipment for heating and applying the emulsified asphalt material. The emulsion shall be applied with a manufacturer-approved computer rate-controlled asphalt distributor. The equipment shall be in good working order and contain no contaminants or diluents in the tank. Spray bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the emulsion. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under eight (8) miles per hour or seven hundred (700) feet per minute.

The equipment will be tested under pressure for leaks and to ensure proper set-up before use to verify truck set-up (via a test-shot area), including but not limited to, nozzle tip size appropriate for application, spray-bar height and pressure and pump speed, evidence of triple-overlap spray pattern, lack of leaks, and any other factors relevant to ensure the truck is in good working order before use.

The distributor truck shall be equipped with a minimum 12-foot spreader spray bar with individual nozzle control with computer-controlled application rates. The distributor truck shall have an easily accessible thermometer that constantly monitors the temperature of the emulsion, and have an operable mechanical tank gauge that can be used to cross-check the computer accuracy. If the distributor is not equipped with an operable quick shutoff valve, the prime operations shall be started and stopped on building paper.

The distributor truck shall be equipped to effectively heat and mix the material to the required temperature prior to application as required. Heating and mixing shall be done in accordance with the manufacturer's recommendations. Do not overheat or over mix the material.

The distributor shall be equipped with a hand sprayer.

Asphalt distributors must be calibrated annually in accordance with ASTM D2995. The Contractor must furnish a current calibration certification for the asphalt distributor truck from any State or other agency as approved by the RPR.

A power broom and/or power blower suitable for cleaning the surfaces to which the asphalt tack coat is to be applied shall be provided.

603-3.3 Application of emulsified asphalt material. The emulsified asphalt shall not be diluted. Immediately before applying the emulsified asphalt tack coat, the full width of surface to be treated shall be swept with a power broom and/or power blower to remove all loose dirt and other objectionable material.

The emulsified asphalt material shall be uniformly applied with an asphalt distributor at the rates appropriate for the conditions and surface specified in the table below. The type of asphalt material and application rate shall be approved by the RPR prior to application.

Emulsified Asphalt

Surface Type	Residual Rate, gal/SY	Emulsion Application Bar Rate, gal/SY
New asphalt	0.02-0.05	0.03-0.07
Existing asphalt	0.04-0.07	0.06-0.11
Milled Surface	0.04-0.08	0.06-0.12
Concrete	0.03-0.05	0.05-0.08

After application of the tack coat, the surface shall be allowed to cure without being disturbed for the period of time necessary to permit drying and setting of the tack coat. This period shall be determined by the RPR. The Contractor shall protect the tack coat and maintain the surface until the next course has been placed. When the tack coat has been disturbed by the Contractor, tack coat shall be reapplied at the Contractor's expense.

603-3.4 Freight and waybills The Contractor shall submit waybills and delivery tickets, during progress of the work. Before the final statement is allowed, file with the RPR certified waybills and certified delivery tickets for all emulsified asphalt materials used in the construction of the pavement covered by the contract. Do not remove emulsified asphalt material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken.

METHOD OF MEASUREMENT

603-4.1 No separate measurement will be made. Tack is incidental to the cost of paving and related items.

BASIS OF PAYMENT

603.5-1 No separate payment will be made. Tack is incidental to the cost of paving and related items.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D1250	Standard Guide for Use of the Petroleum Measurement Tables
ASTM D2995	Standard Practice for Estimating Application Rate and Residual Application Rate of Bituminous Distributors

ASTM D3628 Standard Practice for Selection and Use of Emulsified Asphalts

END OF ITEM P-603

Item P-605 Joint Sealants for Pavements

DESCRIPTION

605-1.1 This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints in pavement; joints between different types of pavements; and cracks in existing pavement.

MATERIALS

605-2.1 Joint sealants. Joint sealant materials shall meet the requirements of ASTM D6690 (for asphalt cracks), or ASTM D5893 (for PCC joints).

Each lot or batch of sealant shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of this specification.

605-2.2 Backer rod. The material furnished shall be a compressible, non-shrinking, non-staining, non-absorbing material that is non-reactive with the joint sealant in accordance with ASTM D5249. The backer-rod material shall be 25% ± 5 % larger in diameter than the nominal width of the joint.

605-2.3 Bond breaking tapes. Not Used.

CONSTRUCTION METHODS

605-3.1 Time of application. Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be 50°F and rising at the time of application of the poured joint sealing material. Do not apply sealant if moisture is observed in the joint.

605-3.2 Equipment. Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, **7** days prior to use on the project.

a. Tractor-mounted routing tool. Provide a routing tool, used for removing old sealant from the joints, of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

b. Concrete saw. Provide a self-propelled power saw, with water-cooled diamond or abrasive saw blades, for cutting joints to the depths and widths specified.

c. Sandblasting equipment. Sandblasting is not allowed.

d. Waterblasting equipment. The Contractor must demonstrate waterblasting equipment including the pumps, hose, guide and nozzle size, under job conditions, before approval in accordance with paragraph 605-3.3. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

e. Hand tools. Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces. Hand tools should be carefully evaluated for potential spalling effects prior to approval for use.

f. Hot-poured sealing equipment. The unit applicators used for heating and installing ASTM D6690 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the

temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.

g. Cold-applied, single-component sealing equipment. The equipment for installing ASTM D5893 single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of the nozzle shall be such that the tip of the nozzle will extend into the joint to allow sealing from the bottom of the joint to the top. Maintain the initially approved equipment in good working condition, serviced in accordance with the supplier's instructions, and unaltered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e., caulking guns) may be used for small applications.

605-3.3 Preparation of joints. Pavement joints for application of material in this specification must be dry, clean of all scale, dirt, dust, curing compound, and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

a. Sawing. All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

b. Sealing. Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by tractor-mounted routing equipment, concrete saw, and water-blaster as specified in paragraph 605-3.2. The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2 inch from the joint edge shall be clean. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and leave them completely free of debris and water. The joint faces shall be surface dry when the seal is applied.

c. Backer Rod. When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a backer rod in accordance with paragraph 605-2.2 to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backer rod is placed at the specified depth and is not stretched or twisted during installation.

d. Bond-breaking tape. Not Used.

605-3.4 Installation of sealants. Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the RPR before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50 feet ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/4 inch ±1/16 inch below the top of PCC pavement surface; or bottom of asphalt for asphalt pavement. Remove and discard excess or spilled sealant from the pavement by approved methods. Install the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the RPR. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

605-3.5 Inspection. The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the airport.

605-3.6 Clean-up. Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

METHOD OF MEASUREMENT

605-4.1 No separate measurement will be made for joint sealing. Joint sealing shall be incidental to the item requiring it.

BASIS OF PAYMENT

605-5.1 Payment for joint sealing material shall be incidental to the item requiring it.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D789	Standard Test Method for Determination of Relative Viscosity of Polyamide (PA)
ASTM D5249	Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints
ASTM D5893	Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt

Advisory Circulars (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids

END OF ITEM P-605

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Item P-606 Adhesive Compounds, Two-Component for Sealing Wire and Lights in Pavement

DESCRIPTION

606-1.1 This specification covers two types of material; a liquid suitable for sealing electrical wire in saw cuts in pavement and for sealing light fixtures or bases in pavement, and a paste suitable for embedding light fixtures in the pavement. Both types of material are two-component filled formulas with the characteristics specified in paragraph 606-2.4. Materials supplied for use with asphalt and/or concrete pavements must be formulated so they are compatible with the asphalt and/or concrete.

MATERIALS

606-2.1 Curing. When pre-warmed to 77°F (25°C), mixed, and placed in accordance with manufacturer's directions, the materials shall cure at temperatures of 45°F (7°C) or above without the application of external heat.

606-2.2 Storage. The adhesive components shall not be stored at temperatures over 86°F (30°C), unless otherwise specified by the manufacturer.

606-2.3 Caution. Installation and use shall be in accordance with the manufacturer's recommended procedures. Avoid prolonged or repeated contact with skin. In case of contact, wash with soap and flush with water. If taken internally, call doctor. Keep away from heat or flame. Avoid vapor. Use in well-ventilated areas. Keep in cool place. Keep away from children.

606-2.4 Characteristics. When mixed and cured in accordance with the manufacturer's directions, the materials shall have the following properties shown in Table 1.

Table 1. Property Requirements

Physical or Electrical Property	Minimum	Maximum	ASTM Method
Tensile			
Portland cement concrete	1,000 psi (70 kg/sq cm)		D 638
Asphalt concrete	500 psi (35 kg/sq cm)		
Elongation			
Portland cement concrete		See note [1]	D 638
Asphalt concrete	50%		D 638
Coef. of cub. exp. cu. cm/cu. cm/°C	0.00090	0.00120	D 1168
Coef. of lin. exp. cm/cm/°C	0.000030	0.000040	D 1168
Dielectric strength, short time test	350 volts/mil.		D 149
Arc resistance	125 sec		
Pull-off			
Adhesion to steel	1,000 psi (70 kg/sq cm)		
Adhesion to Portland cement concrete	200 psi (14 kg/sq cm)		
Adhesion to asphalt concrete	No test available.		
Adhesion to aluminum	250 psi		

[1] 20% or more (without filler) for formulations to be supplied for areas subject to freezing.

SAMPLING, INSPECTION, AND TEST PROCEDURES

606-3.1 Tensile properties. Tests for tensile strength and elongation shall be conducted in accordance with ASTM D638.

606-3.2 Expansion. Tests for coefficients of linear and cubical expansion shall be conducted in accordance with, Method B, except that mercury shall be used instead of glycerine. The test specimen shall be mixed in the proportions specified by the manufacturer, and cured in a glass tub approximately 2 inch (50 mm) long by 3/8 inch (9 mm) in diameter. The interior of the tube shall be precoated with a silicone mold release agent. The hardened sample shall be removed from the tube and aged at room temperature for one (1) week before conducting the test. The test temperature range shall be from 35°F (2°C) to 140°F (60°C).

606-3.3 Test for dielectric strength. Test for dielectric strength shall be conducted in accordance with ASTM D149 for sealing compounds to be furnished for sealing electrical wires in pavement.

606-3.4 Test for arc resistance. Test for arc resistance shall be conducted for sealing compounds to be furnished for sealing electrical wires in pavement.

606-3.5 Test for adhesion to steel. The ends of two smooth, clean, steel specimens of convenient size (1 inch by 1 inch by 6 inch) would be satisfactory when bonded together with adhesive mixture and allowed to cure at room temperature for a period of time to meet formulation requirements and then tested to failure on a Riehle (or similar) tensile tester. The thickness of adhesive to be tested shall be 1/4 inch (6 mm).

606-3.6 Adhesion to Portland cement concrete

a. Concrete test block preparation. The aggregate grading shall be as shown in Table 2.

The coarse aggregate shall consist of crushed rock having a minimum of 75% of the particles with at least one fractured face and having a water absorption of not more than 1.5%. The fine aggregate shall consist of crushed sand manufactured from the same parent rock as the coarse aggregate. The concrete shall have a water-cement ratio of 5.5 gallons (21 liters) of water per bag of cement, a cement factor of 6, ±0.5, bags of cement per cubic yard (0.76 cubic meter) of concrete, and a slump of 2-1/2 inch (60 mm), ±1/2 inch (60 mm ±12 mm). The ratio of fine aggregate to total aggregate shall be approximately 40% by solid volume. The air content shall be 5.0%, ±0.5%, and it shall be obtained by the addition to the batch of an air-entraining admixture such as Vinsol® resin. The mold shall be of metal and shall be provided with a metal base plate.

Means shall be provided for securing the base plate to the mold. The assembled mold and base plate shall be watertight and shall be oiled with mineral oil before use. The inside measurement of the mold shall be such that several one inch (25 mm) by 2-inch (75 mm) by 3-inch (25 mm by 50 mm by 75 mm) test blocks can be cut from the specimen with a concrete saw having a diamond blade. The concrete shall be prepared and cured in accordance with ASTM C192.

Table 2. Aggregate for Bond Test Blocks

Type	Sieve Size	Percent Passing
Coarse Aggregate	3/4 inch (19.0 mm)	97 to 100
	1/2 inch (12.5 mm)	63 to 69
	3/8 inch (9.5 mm)	30 to 36
	No. 4 (4.75 mm)	0 to 3
Fine Aggregate	No. 4 (4.75 mm)	100
	No. 8 (2.36 mm)	82 to 88
	No. 16 (1.18 mm)	60 to 70
	No. 30 (600 µm)	40 to 50
	No. 50 (300 µm)	16 to 26
	No. 100 (150 µm)	5 to 9

b. Bond test. Prior to use, oven-dry the test blocks to constant weight at a temperature of 220°F to 230°F (104°C to 110°C), cool to room temperature, 73.4°F ±3°F (23°C ±1.6°C), in a desiccator, and clean the surface of the blocks of film or powder by vigorous brushing with a stiff-bristled fiber brush. Two test blocks shall be bonded together on the one inch by 3 inch (25 mm by 75 mm) sawed face with the adhesive mixture and allowed to cure at room temperature for a period of time to meet formulation requirements and then tested to failure in a Riehle (or similar) tensile tester. The thickness of the adhesive to be tested shall be 1/4 inch (6 mm).

606-3.7 Compatibility with asphalt mix. Test for compatibility with asphalt in accordance with ASTM D5329.

606-3.8 Adhesive compounds - Contractor's responsibility. The Contractor shall furnish the vendor's certified test reports for each batch of material delivered to the project. The report shall certify that the material meets specification requirements and is suitable for use with asphalt concrete pavements. The report shall be provided to and accepted by the Resident Project Representative (RPR) before use of the material. In addition, the Contractor shall obtain a statement from the supplier or manufacturer that guarantees the material for one year. The supplier or manufacturer shall furnish evidence that the material has performed satisfactorily on other projects.

606-3.9 Application. Adhesive shall be applied on a dry, clean surface, free of grease, dust, and other loose particles. The method of mixing and application shall be in strict accordance with the manufacturer's recommendations. When used with Item P-605, such as light can installation, Item P-605 shall not be applied until the Item P-606 has fully cured.

METHOD OF MEASUREMENT

606-4.1 No measurement will be made for direct payment of adhesive. When required in the installation of an in-pavement lighting system or portion thereof, no measurement will be made for direct payment of adhesive, as the cost of furnishing and installing shall be considered as a subsidiary obligation in the completion of the installation.

BASIS OF PAYMENT

606-5.1 The cost of adhesive shall be incidental to the unit price of in-pavement lights.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C192	Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM D149	Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
ASTM D638	Standard Test Method for Tensile Properties of Plastics
ASTM D5329	Standard Test Methods for Sealants and Fillers, Hot-applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements

END OF ITEM P-606

Item P-610 Concrete for Miscellaneous Structures

DESCRIPTION

610-1.1 This item shall consist of concrete and reinforcement, as shown on the plans, prepared and constructed in accordance with these specifications. This specification shall be used for all concrete other than airfield pavement which are cast-in-place.

MATERIALS

610-2.1 General. Only approved materials, conforming to the requirements of these specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Resident Project Representative (RPR) before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

a. Reactivity. Fine aggregate and coarse aggregates to be used in all concrete shall have been tested separately within six months of the project in accordance with ASTM C1260. Test results shall be submitted to the RPR. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.08% at 14 days (16 days from casting). If the expansion of either or both test specimens is greater than 0.08% at 14 days, but less than 0.20%, a minimum of 25% of Type F fly ash, or between 40% and 55% of slag cement shall be used in the concrete mix.

If the expansion is greater than 0.20% the aggregates shall not be used, and test results for other aggregates must be submitted for evaluation.

610-2.2 Coarse aggregate. The coarse aggregate for concrete shall meet the requirements of ASTM C33 and the requirements of Table 4, Class Designation 5S; and the grading requirements shown below, as required for the project.

Coarse Aggregate Grading Requirements

Maximum Aggregate Size	ASTM C33, Table 3 Grading Requirements (Size No.)
1 1/2 inch (37.5 mm)	467 or 4 and 67
1 inch (25 mm)	57
¾ inch (19 mm)	67
½ inch (12.5 mm)	7

610-2.2.1 Coarse aggregate susceptibility to durability (D) cracking. Not used.

610-2.3 Fine aggregate. The fine aggregate for concrete shall meet all fine aggregate requirements of ASTM C33.

610-2.4 Cement. Cement shall conform to the requirements of ASTM C150 Type V.

610-2.5 Cementitious materials.

a. Fly ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash shall have a Calcium Oxide (CaO) content of less than 15% and a total available alkali content less than 3% per ASTM C311. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the concrete mix and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the RPR.

b. Slag cement (ground granulated blast furnace (GGBF)). Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.

610-2.6 Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

610-2.7 Admixtures. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the RPR may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the RPR from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

c. Other chemical admixtures. The use of set retarding, and set-accelerating admixtures shall be approved by the RPR. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

610-2.8 Premolded joint material. Premolded joint material for expansion joints shall meet the requirements of ASTM D1751**.**

610-2.9 Joint filler. The filler for joints shall meet the requirements of Item P-605, unless otherwise specified.

610-2.10 Steel reinforcement. Reinforcing shall consist of deformed bar conforming to the requirements of ASTM A615, unless otherwise specified on the plans.

610-2.11 Materials for curing concrete. Curing materials shall be white-pigmented liquid membrane-forming compound, Type 2, Class B and shall conform to ASTM C309.

CONSTRUCTION METHODS

610-3.1 General. The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the RPR.

610-3.2 Concrete mixture. The concrete shall develop a compressive strength of 4000 psi in 28 days as determined by test cylinders made in accordance with ASTM C31 and tested in accordance with ASTM C39. The concrete shall contain not less than 470 pounds of cementitious material per cubic yard. The water cementitious ratio shall not exceed 0.45 by weight. The air content of the concrete shall be 5% +/- 1.2% as determined by ASTM C231 and shall have a slump of not more than 4 inches as determined by ASTM C143.

610-3.3 Mixing. Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94 or ASTM C685.

The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F without the RPRs approval. If approval is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F nor more than 100°F. The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material is not permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

610-3.4 Forms. Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the RPR. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface.

610-3.5 Placing reinforcement. All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

610-3.6 Embedded items. Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

610-3.7 Concrete consistency. The Contractor shall monitor the consistency of the concrete delivered to the project site; collect each batch ticket; check temperature; and perform slump tests on each truck at the project site in accordance with ASTM C143.

610-3.8 Placing concrete. All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been approved by the RPR. Concrete shall be

placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of more than 5 feet. Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

610-3.9 Vibration. Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309R, Guide for Consolidation of Concrete.

610-3.10 Joints. Joints shall be constructed as indicated on the plans.

610-3.11 Finishing. All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated.

610-3.12 Curing and protection. All concrete shall be properly cured in accordance with the recommendations in American Concrete Institute (ACI) 308R, Guide to External Curing of Concrete. The concrete shall be protected from damage until project acceptance.

610-3.13 Cold weather placing. When concrete is placed at temperatures below 40°F, follow the cold weather concreting recommendations found in ACI 306R, Cold Weather Concreting.

610-3.14 Hot weather placing. When concrete is placed in hot weather greater than 85ºF, follow the hot weather concreting recommendations found in ACI 305R, Hot Weather Concreting.

QUALITY ASSURANCE (QA)

610-4.1 Quality Assurance sampling and testing. Concrete for each day's placement will be accepted on the basis of the compressive strength specified in paragraph 610-3.2. The RPR will sample the concrete in accordance with ASTM C172; test the slump in accordance with ASTM C143; test air content in accordance with ASTM C231; make and cure compressive strength specimens in accordance with ASTM C31; and test in accordance with ASTM C39. The QA testing agency will meet the requirements of ASTM C1077.

The Contractor shall provide adequate facilities for the initial curing of cylinders.

610-4.2 Defective work. Any defective work that cannot be satisfactorily repaired as determined by the RPR, shall be removed and replaced at the Contractor's expense. Defective work includes, but is not limited to, uneven dimensions, honeycombing and other voids on the surface or edges of the concrete.

METHOD OF MEASUREMENT

610-5.1 Concrete shall be considered incidental to the work performed and no separate measurement shall be made.

BASIS OF PAYMENT

610-6.1 Concrete shall be considered incidental and no separate payment shall be made. This price shall be full compensation for furnishing all materials including reinforcement and embedded items and for all preparation, delivery, installation, and curing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A884	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete
ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete

ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C685	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1157	Standard Performance Specification for Hydraulic Cement
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1365	Standard Test Method for Determination of the Proportion of Phases in Portland Cement and Portland-Cement Clinker Using X-Ray Powder Diffraction Analysis
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types)

American Concrete Institute (ACI)

ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 308R	Guide to External Curing of Concrete
ACI 309R	Guide for Consolidation of Concrete

END OF ITEM P-610

Item P-620 Runway and Taxiway Marking

DESCRIPTION

620-1.1 This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Resident Project Representative (RPR). The terms “paint” and “marking material” as well as “painting” and “application of markings” are interchangeable throughout this specification.

MATERIALS

620-2.1 Materials acceptance. The Contractor shall furnish manufacturer’s certified test reports, for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. This certification along with a copy of the paint manufacturer’s surface preparation; marking materials, including adhesion, flow promoting and/or floatation additive; and application requirements must be submitted and approved by the Resident Project Representative (RPR) prior to the initial application of markings. The reports can be used for material acceptance or the RPR may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the RPR upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers that are easily quantifiable for inspection by the RPR.

620-2.2 Marking materials.

Table 1. Marking Materials

Paint					Glass Beads	
Type	**Color**	**Coat**	**Fed Std. 595 Number**	**Application Rate Maximum**	**Type**	**Application Rate Minimum**
II	White	First	37925	115 ft^2/gal	III	10 lb/gal
II	White	Second	37925	115 ft^2/gal	III	10 lb/gal
II	Red	First	31136	115 ft^2/gal	I	5 lb/gal
II	Red	Second	31136	115 ft^2/gal	I	5 lb/gal
II	Yellow	First	33538 or 33655	115 ft^2/gal	III	10 lb/gal
II	Yellow	Second	33538 or 33655	115 ft^2/gal	III	10 lb/gal
II	Yellow	First	33538 or 33655	115 ft^2/gal	n/a	n/a
II	Yellow	Second	33538 or 33655	115 ft^2/gal	n/a	n/a
II	Black	First	37038	115 ft^2/gal	n/a	n/a
II	Green	First	34108	115 ft^2/gal	n/a	n/a

a. Paint. Paint shall be waterborne in accordance with the requirements of this paragraph. Paint colors shall comply with Federal Standard No. 595. Waterborne paint shall meet the requirements of Federal Specification TT-P-1952F, Type II. The non-volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis.

b. Reflective media. Glass beads for white and yellow paint shall meet the requirements for Federal Specification TT-B-1325D Type III**.**

Glass beads for red and pink paint shall meet the requirements for Type I, Gradation A.

Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

Glass beads shall not be used in black and green paint, nor in yellow chevrons.

Type III glass beads shall not be used in red and pink paint.

CONSTRUCTION METHODS

620-3.1 Weather limitations. Painting shall only be performed when the surface is dry, and the ambient temperature and the pavement surface temperature meet the manufacturer's recommendations in accordance with paragraph 620-2.1. Painting operations shall be discontinued when the ambient or surface temperatures does not meet the manufacturer's recommendations. Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns. Markings shall not be applied when weather conditions are forecasts to not be within the manufacturers' recommendations for application and dry time.

620-3.2 Equipment. Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless type marking machine with automatic glass bead dispensers suitable for application of traffic paint. It shall produce an even and uniform film thickness and appearance of both paint and glass beads at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray. The marking equipment for both paint and beads shall be calibrated daily.

620-3.3 Preparation of surfaces. Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other contaminates that would reduce the bond between the paint and the pavement. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the RPR. After the cleaning operations, sweeping, blowing, or rinsing with pressurized water shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

a. Preparation of new pavement surfaces. The area to be painted shall be cleaned by broom, blower, water blasting, or by other methods approved by the RPR to remove all contaminants, including PCC curing compounds, minimizing damage to the pavement surface.

b. Preparation of pavement to remove existing markings. Existing pavement markings shall be removed by rotary grinding, water blasting, or by other methods approved by the RPR minimizing damage to the pavement surface. The removal area may need to be larger than the area of the markings to eliminate ghost markings. After removal of markings on asphalt pavements, apply a fog seal or seal coat to 'block out' the removal area to eliminate 'ghost' markings.

c. Preparation of pavement markings prior to remarking. Prior to remarking existing markings, loose existing markings must be removed minimizing damage to the pavement surface, with a method approved by the RPR. After removal, the surface shall be cleaned of all residue or debris.

Prior to the application of markings, the Contractor shall certify in writing that the surface is dry and free from dirt, grease, oil, laitance, or other foreign material that would prevent the bond of the paint to the pavement or existing markings. This certification along with a copy of the paint manufactures application and surface preparation requirements must be submitted to the RPR prior to the initial application of markings.

620-3.4 Layout of markings. The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the plans.

620-3.5 Application. A period of 28 days shall elapse between placement of surface course or seal coat and application of the permanent paint markings. Paint shall be applied at the locations and to the

dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by the RPR.

The edges of the markings shall not vary from a straight line more than 1/2 inch (12 mm) in 50 feet (15 m), and marking dimensions and spacing shall be within the following tolerances:

Dimension and Spacing	Tolerance
36 inch (910 mm) or less	±1/2 inch
greater than 36 inch to 6 feet (910 mm to 1.85 m)	±1 inch
greater than 6 feet to 60 feet (1.85 m to 18.3 m)	±2 inch
greater than 60 feet (18.3 m)	±3 inch

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted.

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment and distribution should be performed.

620-3.6 Application-preformed thermoplastic airport pavement markings.

Preformed thermoplastic pavement markings not used.

620-3.7 Control strip. Prior to the full application of airfield markings, the Contractor shall prepare a control strip in the presence of the RPR. The Contractor shall demonstrate the surface preparation method and all striping equipment to be used on the project. The marking equipment must achieve the prescribed application rate of paint and population of glass beads (per Table 1) that are properly embedded and evenly distributed across the full width of the marking. Prior to acceptance of the control strip, markings must be evaluated during darkness to ensure a uniform appearance.

620-3.8 Retro-reflectance. Reflectance shall be measured by the Contractor with a portable retro-reflectometer meeting ASTM E1710 (or equivalent). A total of 6 reading shall be taken over a 6 square foot area with 3 readings taken from each direction. The average shall be equal to or above the minimum levels of all readings which are within 30% of each other.

Minimum Retro-Reflectance Values

Material	Retro-reflectance mcd/m^2/lux		
	White	Yellow	Red
Initial Type I	300	175	35
Initial Type III	600	300	35
Initial Thermoplastic	225	100	35
All materials, remark when less than[1]	100	75	10

[1] 'Prior to remarking determine if removal of contaminants on markings will restore retro-reflectance.

620-3.9 Protection and cleanup. After application of THE markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the RPR. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and federal environmental statutes and regulations.

METHOD OF MEASUREMENT

620-4.1 No separate measurement will be made for pavement preparation. Pavement preparation is incidental to the measurement of marking and will not be paid separately.

620-4.2 The quantity of markings shall be paid for shall be measured by the number of square feet of painting**.**

620-4.3 The quantity of reflective media shall be incidental to the measurement of marking and will not be paid separately.

BASIS OF PAYMENT

This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item complete in place and accepted by the RPR in accordance with these specifications.

620-5.1 No separate payment will be made for pavement preparation.

620-5.2 Payment for markings shall be made at the contract price for by the number of square feet. For markings requiring 2 coats, the first coat will be paid at 75% of the contract unit price. The second coat will be paid the remaining 25% of the contract unit price.

620-5.3 No separate payment will be made for reflective media.

Payment will be made under:

Item P-620-5.2a	Marking, 2 Coats with Beads (All Colors)
Item P-620-5.2b	Marking, 2 Coats with No Beads (All Colors)
Item P-620-5.2c	Marking, 1 Coat with No Beads (All Colors)
Item P-620-5.2d	Marking, 1 Coat with Beads (All Colors)

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D476	Standard Classification for Dry Pigmentary Titanium Dioxide Products
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2074	Standard Test Method for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness

ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E303	Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM E2302	Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a Portable Reflectometer
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

Code of Federal Regulations (CFR)

	40 CFR Part 60, Appendix A-7, Method 24 Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings
29 CFR Part 1910.1200	Hazard Communication

Federal Specifications (FED SPEC)

FED SPEC TT-B-1325D	Beads (Glass Spheres) Retro-Reflective
FED SPEC TT-P-1952F	Paint, Traffic and Airfield Marking, Waterborne
FED STD 595	Colors used in Government Procurement

Commercial Item Description

A-A-2886B	Paint, Traffic, Solvent Based

Advisory Circulars (AC)

AC 150/5340-1	Standards for Airport Markings
AC 150/5320-12	Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces

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Item P-621 Saw-Cut Grooves

DESCRIPTION

621-1.1 This item consists of constructing saw-cut grooves to minimize hydroplaning during wet weather, providing a skid resistant surface in accordance with these specifications and at the locations shown on the plans, or as directed by the Resident Project Representative (RPR).

CONSTRUCTION METHODS

621-2.1 Procedures. The Contractor shall submit to the RPR the grooving sequence and method of placing guidelines to control grooving operation. Transverse grooves saw-cut in the pavement must form a 1/4 inch (+1/16 inch, -0 inch) wide by 1/4 inch (±1/16 inch) deep by 1-1/2 inch (-1/8 inch, +0 inch) center-to-center configuration. The grooves must be continuous for the entire runway length. They must be saw-cut transversely (perpendicular to centerline) in the runway and high-speed taxiway pavement to not less than 10 feet from the pavement edge to allow adequate space for equipment operation.

The saw-cut grooves must meet the following tolerances. The tolerances apply to each day's production and to each piece of grooving equipment used for production. The Contractor is responsible for all controls and process adjustments necessary to meet these tolerances. The Contractor shall routinely spot check for compliance each time the equipment aligns for a grooving pass.

a. Alignment tolerance. The grooves shall not vary more than ±1-1/2 inch in alignment for 75 feet along the runway length, allowing for realignment every 500 feet along the runway length.

b. Groove tolerance.

(1) Depth. The standard depth is 1/4 inch. At least 90% of the grooves must be at least 3/16 inch, at least 60% of the grooves must be at least 1/4 inch, and not more than 10% of the grooves may exceed 5/16 inch.

(2) Width. The standard width is 1/4 inch. At least 90% of the grooves must be at least 3/16 inch, at least 60% of the grooves must be at least 1/4 inch, and not more than 10% of the grooves may exceed 5/16 inch.

(3) Center-to-center spacing. The standard spacing is 1-1/2 inch. Minimum spacing 1-3/8 inch. Maximum spacing 1-1/2 inch.

Saw-cut grooves must not be closer than 3 inches or more than 9 inches from transverse joints in concrete pavements. Grooves must not be closer than 6 inches and no more than 18 inches from in-pavement light fixtures. Grooves may be continued through longitudinal construction joints. Where neoprene compression seals have been installed and the compression seals are recessed sufficiently to prevent damage from the grooving operation, grooves may be continued through the longitudinal joints. Where neoprene compression seals have been installed and the compression seals are not recessed sufficiently to prevent damage from the grooving operation, grooves must not be closer than 3 inches or more than 5 inches from the longitudinal joints. Where lighting cables are installed, grooving through longitudinal or diagonal saw kerfs shall not be allowed.

621-2.2 Environmental requirements. Grooving operations will not be permitted when freezing conditions prevent the immediate removal of debris and/or drainage of water from the grooved area. Discharge and disposal of waste slurry shall be the Contractor's responsibility.

621-2.3 Control strip. Groove a control strip in an area of the pavement outside of the trafficked area, as approved by the RPR. The area shall be **50** feet long by two lanes wide. Demonstrate the setup and alignment process, the grooving operation, and the waste slurry disposal.

621-2.4 Existing pavements. Bumps, depressed areas, bad or faulted joints, and badly cracked and/or spalled areas in the pavement shall not be grooved until such areas are adequately repaired or replaced.

621-2.5 New pavements. New asphalt and Portland cement concrete pavements shall be allowed to cure for a minimum of 30 days before grooving, to allow the material to become stable enough to prevent closing of the grooves under normal use. If it can be demonstrated that the grooves are stable, and can be installed with no spalling, tearing or raveling of the groove edge, grooving may occur sooner than 30 days with approval of the RPR. All grade corrections must be completed prior to grooving. Spalling along or tearing or raveling of the groove edges shall not be allowed.

621-2.6 Grooving machine. Provide a grooving machine that is power driven, self-propelled, specifically designed and manufactured for pavement grooving, and has a self-contained and integrated continuous slurry vacuum system as the primary method for removing waste slurry. The grooving machine shall be equipped with diamond-saw cutting blades, and capable of making at least 18 inches in width of multiple parallel grooves in one pass of the machine. Thickness of the cutting blades shall be capable of making the required width and depth of grooves in one pass of the machine. The cutting head shall not contain a mixture of new and worn blades or blades of unequal wear or diameter. Match the blade type and configuration with the hardness of the existing airfield pavement. The wheels on the grooving machine shall be of a design that will not scar or spall the pavement. Provide the machine with devices to control depth of groove and alignment.

621-2.7 Water supply. Water for the grooving operation shall be provided by the Contractor.

621-2.8 Clean-up. During and after installation of saw-cut grooves, the Contractor must remove from the pavement all debris, waste, and by-products generated by the operations to the satisfaction of the RPR. Cleanup of waste material must be continuous during the grooving operation. Flush debris produced by the machine to the edge of the grooved area or pick it up as it forms. The dust coating remaining shall be picked up or flushed to the edge of the area if the resultant accumulation is not detrimental to the vegetation or storm drainage system. Accomplish all flushing operations in a manner to prevent erosion on the shoulders or damage to vegetation. Waste material must be disposed of in an approved manner. Waste material must not be allowed to enter the airport storm sewer system. The Contractor must dispose of these wastes in strict compliance with all applicable state, local, and federal environmental statutes and regulations

621-2.9 Repair of damaged pavement. Grooving must be stopped and damaged pavement repaired at the Contractor's expense when directed by the RPR.

621-2.10 Reserved.

ACCEPTANCE

621-3.1 Acceptance testing. Grooves will be accepted based on results of zone testing. All acceptance testing necessary to determine conformance with the groove tolerances specified will be performed by the RPR.

Instruments for measuring groove width and depth must have a range of at least 0.5 inch and a resolution of at least 0.005 inch. Gauge blocks or gauges machined to standard grooves width, depth, and spacing may be used.

Instruments for measuring center-to-center spacing must have a range of at least 3 inches and a resolution of at least 0.02 inch.

The RPR will measure grooves in five zones across the pavement width. Measurements will be made at least three times during each day's production. Measurements in all zones will be made for each cutting head on each piece of grooving equipment used for each day's production.

The five zones are as follows:

Zone 1	Centerline to 5 feet left or right of the centerline.
Zone 2	5 feet to 25 feet left of the centerline.
Zone 3	5 feet to 25 feet right of the centerline.
Zone 4	25 feet to edge of grooving left of the centerline.
Zone 5	25 feet to edge of grooving right of the centerline.

At a random location within each zone, five consecutive grooves sawed by each cutting head on each piece of grooving equipment will be measured for width, depth, and spacing. The five consecutive measurements must be located about the middle blade of each cutting head ±4 inches. Measurements will be made along a line perpendicular to the grooves.

- Width or depth measurements less than 0.170 inch shall be considered less than 3/16 inch.
- Width or depth measurements more than 0.330 inch shall be considered more than 5/16 inch.
- Width or depth measurements more than 0.235 inch shall be considered more than 1/4 inch.

Production must be adjusted when more than one groove on a cutting head fails to meet the standard depth, width, or spacing in more than one zone.

METHOD OF MEASUREMENT

621-4.1 The quantity of grooving to be paid for shall be the number of square yards of grooving performed in accordance with the specifications and accepted by the RPR per paragraph 621-3.1.

BASIS OF PAYMENT

621-5.1 Payment for saw-cut grooving. Payment for saw-cut grooving will be made at the contract unit price per square yard for saw-cut grooving. This price shall be full compensation for furnishing all materials, and for all preparation, delivering, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-621-5.1	Grooving - per square yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5320-12	Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces

END OF ITEM P-621

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Item D-701 Pipe for Storm Drains and Culverts

DESCRIPTION

701-1.1 This item shall consist of the construction of pipe culverts and storm drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

701-2.1 Materials shall meet the requirements shown on the plans and specified below. Underground piping and components used in drainage systems for terminal and aircraft fueling ramp drainage shall be noncombustible and inert to fuel in accordance with National Fire Protection Association (NFPA) 415.

701-2.2 Pipe. The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements:

ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
ASTM C1479	Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations
ASTM C1840	Standard Practice for Inspection and Acceptance of Installed Reinforced Concrete Culvert, Storm Drain, and Storm Sewer Pipe

701-2.3 Concrete. Concrete for pipe cradles shall have a minimum compressive strength of 2000 psi (13.8 MPa) at 28 days and conform to the requirements of ASTM C94.

701-2.4 Rubber gaskets. Rubber gaskets for rigid pipe shall conform to the requirements of ASTM C443. Rubber gaskets for PVC pipe, polyethylene, and polypropylene pipe shall conform to the requirements of ASTM F477. Rubber gaskets for zinc-coated steel pipe and precoated galvanized pipe shall conform to the requirements of ASTM D1056, for the “RE” closed cell grades. Rubber gaskets for steel reinforced thermoplastic ribbed pipe shall conform to the requirements of ASTM F477.

701-2.5 Joint mortar. Not used.

701-2.6 Joint fillers. Not used.

701-2.7 Plastic gaskets. Not used.

701-2.8. Controlled low-strength material (CLSM). Controlled low-strength material shall conform to the requirements of Item P-153. When CLSM is used, all joints shall have gaskets.

701-2.9 Precast box culverts. Not used.

701-2.10 Precast concrete pipe. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or American Concrete Pipe Association QCast Plant Certification program.

CONSTRUCTION METHODS

701-3.1 Excavation. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but it shall not be less than the external diameter of the pipe plus 12 inches on each side. The trench walls shall be approximately vertical.

The Contractor shall comply with all current federal, state and local rules and regulations governing the safety of men and materials during the excavation, installation and backfilling operations. Specifically, the Contractor shall observe that all requirements of the Occupational Safety and Health Administration (OSHA)

relating to excavations, trenching and shoring are strictly adhered to. The width of the trench shall be sufficient to permit satisfactorily jointing of the pipe and thorough compaction of the bedding material under the pipe and backfill material around the pipe, but it shall not be greater than the widths shown on the plans trench detail.

Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 8 inch or 1/2 inch for each foot of fill over the top of the pipe (whichever is greater) but for no more than three-quarters of the nominal diameter of the pipe. The excavation below grade should be filled with granular material to form a uniform foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The RPR shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

The excavation for pipes placed in embankment fill shall not be made until the embankment has been completed to a height above the top of the pipe as shown on the plans.

701-3.2 Bedding. The bedding surface for the pipe shall provide a foundation of uniform density to support the pipe throughout its entire length.

a. Rigid pipe. The pipe bedding shall be constructed uniformly for the full length of the pipe barrel, as required on the plans. The maximum aggregate size shall be 1 in when the bedding thickness is less than 6 inches, and 1-1/2 inch when the bedding thickness is greater than 6 inches. Bedding shall be loosely placed uncompacted material under the middle third of the pipe prior to placement of the pipe.

701-3.3 Laying pipe. The pipe laying shall begin at the lowest point of the trench and proceed upgrade. The lower segment of the pipe shall be in contact with the bedding throughout its full length. Bell or groove ends of rigid pipes and outside circumferential laps of flexible pipes shall be placed facing upgrade.

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

Elliptical and elliptically reinforced concrete pipes shall be placed with the manufacturer's reference lines designating the top of the pipe within five degrees of a vertical plane through the longitudinal axis of the pipe.

701-3.4 Joining pipe. Joints shall be made with (1) rubber gaskets

a. Concrete pipe. Concrete pipe may be either bell and spigot or tongue and groove. Pipe sections at joints shall be fully seated and the inner surfaces flush and even. Concrete pipe joints shall be sealed with rubber gaskets meeting ASTM C443 when leak resistant joints are required.

701-3.5 Embedment and Overfill. Pipes shall be inspected before any fill material is placed; any pipes found to be out of alignment, unduly settled, or damaged shall be removed and re-laid or replaced at the Contractor's expense.

701-3.5-1 Embedment Material Requirements

a. Concrete Pipe. Embedment material and compaction requirements shall be in accordance with the applicable Type of Standard Installation (Types 1, 2, 3, or 4) per ASTM C1479. If a concrete cradle or CLSM embedment material is used, it shall conform to the plan details.

701-3.5-2 Placement of Embedment Material

The embedment material shall be compacted in layers not exceeding 6 inches on each side of the pipe and shall be brought up one foot above the top of the pipe or to natural ground level, whichever is greater. Thoroughly compact the embedment material under the haunches of the pipe without displacing the pipe. Material shall be brought up evenly on each side of the pipe for the full length of the pipe.

When the top of the pipe is above the top of the trench, the embedment material shall be compacted in layers not exceeding 6 inches and shall be brought up evenly on each side of the pipe to one foot above the top of the pipe. All embedment material shall be compacted to a density required under Item P-152.

Concrete cradles and flowable fills, such as controlled low strength material (CLSM) or controlled density fill (CDF), may be used for embedment provided adequate flotation resistance can be achieved by restraints, weighing, or placement technique. CLSM shall be used for all pipes within proposed pavement areas.

It shall be the Contractor's responsibility to protect installed pipes and culverts from damage due to construction equipment operations. The Contractor shall be responsible for installation of any extra strutting or backfill required to protect pipes from the construction equipment.

701-3.6 Overfill

Pipes shall be inspected before any overfill is in place. Any pipes found to be out of alignment, unduly settled, or damaged shall be removed and relaid or replaced at the Contractor's expense. Evaluation of any damage to RCP shall be evaluated based on AASHTO R73.

Overfill material shall be place and compacted in layers as required to achieve compaction to at least 95 percent standard proctor per ASTM D1557. The soil shall contain no debris, organic matter, frozen material, or stones with a diameter greater than one half the thickness of the compacted layers being placed.

701-3.7 Inspection Requirements

An initial post installation inspection shall be performed by the RPR no sooner than 30 days after completion of installation and final backfill. Clean or flush all lines prior to inspection.

Use a camera with lighting suitable to allow a clear picture of the entire periphery of the pipe interior. Center the camera in the pipe both vertically and horizontally and be able to pan and tilt to a 90-degree angle with the axis of the pipe rotating 360 degrees. Use equipment to move the camera through the pipe that will not obstruct the camera's view or interfere with proper documentation of the pipe's condition. The video image shall be clear, focused, and relatively free from roll, static, or other image distortion qualities that would prevent the reviewer from evaluating the condition of the pipe. Reinforced concrete pipe shall be inspected, evaluated, and reported on in accordance with ASTM C1840, "Standard Practice for Inspection and Acceptance of Installed Reinforced Concrete Culvert, Storm Drain, and Storm Sewer Pipe." Any issues reported shall include still photo and video documentation. The zoom ratio shall be provided for all still or video images that document any issues of concern by the inspection firm.

METHOD OF MEASUREMENT

701-4.1 The length of pipe shall be measured in linear feet of pipe in place, completed, and accepted. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. Each class, type and size of pipe shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipe being measured and shall not be measured separately. Pipes within pavement shall include CLSM per P-153. Backfill and spoils from trenching shall not be measured separately.

BASIS OF PAYMENT

These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, off-haul, and disposal of excess material, backfill, and installation of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

701-5.1 Payment will be made at the contract unit price per linear foot for Reinforced Concrete Pipe (RCP) inch RCP.

Payment will be made under:

Item 701-5.1	12-inch RCP, Class IV, outside Pavement Areas - per linear foot
Item 701-5.2	12-inch RCP, Class IV, within Pavement Areas - per linear foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

American Association of State Highway and Transportation Officials (AASHTO)

ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C94	Standard Specification for Ready Mixed Concrete
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C506	Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
ASTM C990	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
ASTM D1056	Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber

National Fire Protection Association (NFPA)

NFPA 415	Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways

END OF ITEM D-701

Item D-705 Pipe Underdrains for Airports

DESCRIPTION

705-1.1 This item shall consist of the construction of pipe drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

705-2.1 General. Materials shall meet the requirements shown on the plans and specified below.

Perforated and solid wall plastic underdrain pipes shall be PVC SDR 35

705-2.2 Pipe. The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements.

ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM F758	Standard Specification for Smooth-Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage

705-2.3 Joint mortar. Not used.

705-2.4 Elastomeric seals. Elastomeric seals shall conform to the requirements of ASTM F477.

705-2.5 Porous backfill. Porous backfill shall be free of clay, humus, or other objectionable matter, and shall conform to CALTRANS Standard Specification 68-2.02F(2) Class 1 Permeable Material when tested in accordance with ASTM C136.

705-2.6 Granular material. Granular material used for backfilling shall conform to the requirements of ASTM D2321 for Class IA, IB, or II materials.

705-2.7 Filter fabric. The filter fabric shall conform to the requirements of CALTRANS Standard Specification 96-1.02B, Nonwoven, Class A.

705-2.8 Controlled low-strength material (CLSM). Not used.

705-2.9 Cleanouts. Cleanout riser shall be constructed of the same material as defined in section 705-2.2 but shall be non-perforated. The frame and lid shall be a round, ductile iron, secured frame and lid with concrete collar conforming to the requirements of item P-610 and as detailed on the plans. The lid shall be labeled “CO”. The frame and lid shall withstand a minimum tire pressure of 250 psi.

CONSTRUCTION METHODS

705-3.1 Equipment. All equipment required for the construction of pipe underdrains shall be on the project, in good working condition, and approved by the RPR before construction is permitted to start.

705-3.2 Excavation. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe but shall not be less than the external diameter of the pipe plus 6 inches on each side of the pipe. The trench walls shall be approximately vertical.

Where rock, hardpan, or other unyielding material is encountered, it shall be removed below the foundation grade for a depth of at least 4 inches. The excavation below grade shall be backfilled with selected fine

compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The RPR shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

Excavated material not required or acceptable for backfill shall be disposed of by the Contractor as directed by the RPR. The excavation shall not be carried below the required depth; if this occurs, the trench shall be backfilled at the Contractor's expense with material approved by the RPR and compacted to the density of the surrounding material.

The pipe bedding shall be constructed uniformly over the full length of the pipe barrel, as required on the plans. The maximum aggregate size shall be 1 inch when the bedding thickness is less than 6 inches, and 1-1/2 inch when the bedding thickness is greater than 6 inches. Bedding shall be loosely placed, uncompacted material under the middle third of the pipe prior to placement of the pipe.

The Contractor shall do trench bracing, sheathing, or shoring necessary to perform and protect the excavation as required for safety and conformance to federal, state, and local laws. Unless otherwise provided, the bracing, sheathing, or shoring shall be removed by the Contractor after the backfill has reached at least 12 inches over the top of the pipe. The sheathing or shoring shall be pulled as the granular backfill is placed and compacted to avoid any unfilled spaces between the trench wall and the backfill material. The cost of bracing, sheathing, or shoring, and the removal of same, shall be included in the unit price bid per foot for the pipe.

705-3.3 Laying and installing pipe

a. Concrete pipe. Not used.

b. Metal pipe. Not used.

c. PVC, fiberglass, or polyethylene pipe. PVC or polyethylene pipe shall be installed in accordance with the requirements of ASTM D2321. Perforations shall meet the requirements of AASHTO M252 or AASHTO M294 Class 2, unless otherwise indicated on the plans. The pipe shall be laid accurately to line and grade.

d. All types of pipe. The upgrade end of pipelines, not terminating in a structure, shall be plugged or capped as approved by the RPR.

Unless otherwise shown on the plans, a 4-inch bed of granular backfill material shall be spread in the bottom of the trench throughout the entire length under all perforated pipe underdrains.

Pipe outlets for the underdrains shall be constructed when required or shown on the plans. The pipe shall be laid with tight-fitting joints. Porous backfill is not required around or over pipe outlets for underdrains. All connections to other drainage pipes or structures shall be made as required and in a satisfactory manner. If connections are not made to other pipes or structures, the outlets shall be protected and constructed as shown on the plans.

e. Filter fabric. The filter fabric shall be installed in accordance with the manufacturer's recommendations, or in accordance with the AASHTO M288 Appendix, unless otherwise shown on the plans.

705-3.4 Mortar. The mortar shall be of the desired consistency for caulking and filling the joints of the pipe and for making connections to other pipes or to structures. Mortar that is not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted.

705-3.5 Joints in concrete pipe. Not used.

705-3.6 Embedment and Backfill

a. Earth. All trenches and excavations shall be backfilled soon after the pipes are installed, unless additional protection of the pipe is directed. The embedment material shall be select material from

excavation or borrow and shall be approved by the RPR. The select material shall be placed on each side of the pipe out to a distance of the nominal pipe diameter and one foot over the top of the pipe and shall be readily compacted. It shall not contain stones 3 inches or larger in size, frozen lumps, chunks of highly plastic clay, or any other material that is objectionable to the RPR. The material shall be moistened or dried, as required to aid compaction. Placement of the embedment material shall not cause displacement of the pipe. Thorough compaction under the haunches and along the sides to the top of the pipe shall be obtained.

The embedment material shall be placed in loose layers not exceeding 6 inches in depth under and around the pipe. Backfill material over the pipe shall be placed in lifts not exceeding 8 inches. Successive layers shall be added and thoroughly compacted by hand and pneumatic tampers, approved by the RPR, until the trench is completely filled and brought to the planned elevation. Embedment and backfilling shall be done to avoid damaging top or side of the pipe.

In embankments and other unpaved areas, the backfill shall be compacted per Item P-152 to the density required for embankments in unpaved areas. Under paved areas, the subgrade and any backfill shall be compacted per Item P-152 to the density required for embankments for paved areas.

b. Granular backfill. When granular backfill is required, placement in the trench and about the pipe shall be as shown on the plans. The granular backfill shall not contain an excessive amount of foreign matter, nor shall soil from the sides of the trench or from the soil excavated from the trench be allowed to filter into the granular backfill. When required by the RPR, a template shall be used to properly place and separate the two sizes of backfill. The backfill shall be placed in loose layers not exceeding 6 inches in depth. The granular backfill shall be compacted by hand and pneumatic tampers to the requirements as given for embankment. Backfilling shall be done to avoid damaging top or side pressure on the pipe. The granular backfill shall extend to the elevation of the trench or as shown on the plans.

When perforated pipe is specified, granular backfill material shall be placed along the full length of the pipe. The position of the granular material shall be as shown on the plans.

If porous backfill is placed in paved or adjacent to paved areas before grading or subgrade operations is completed, the backfill material shall be placed immediately after laying the pipe. The depth of the granular backfill shall be not less than 12 inches, measured from the top of the underdrain. During subsequent construction operations, a minimum depth of 12 inches of backfill shall be maintained over the underdrains. When the underdrains are to be completed, any unsuitable material shall be removed exposing the porous backfill. Porous backfill containing objectionable material shall be removed and replaced with suitable material. The cost of removing and replacing any unsuitable material shall be at the Contractor’s expense.

If a granular subbase blanket course is used which extends several feet beyond the edge of paving to the outside edge of the underdrain trench, the granular backfill material over the underdrains shall be placed in the trench up to an elevation of 2 inches above the bottom surface of the granular subbase blanket course. Immediately prior to the placing of the granular subbase blanket course, the Contractor shall blade this excess trench backfill from the top of the trench onto the adjacent subgrade where it can be incorporated into the granular subbase blanket course. Any unsuitable material that remains over the underdrain trench shall be removed and replaced. The subbase material shall be placed to provide clean contact between the subbase material and the underdrain granular backfill material for the full width of the underdrain trench.

c. Controlled low-strength material (CLSM). Not used.

705-3.7 Flexible Pipe Ring Deflection. The flexible pipe shall be inspected by the Contractor during and after installation to ensure that the internal diameter of the pipe barrel has not been reduced by more than 5 percent. For guidance on properly sizing mandrels, refer to ASTM D3034 and ASTM F679 appendices.

705-3.8 Connections. When the plans call for connections to existing or proposed pipe or structures, these connections shall be watertight and made to obtain a smooth uniform flow line throughout the drainage system.

705-3.9 Cleaning and restoration of site. After the backfill is completed, the Contractor shall dispose of all surplus material, soil, and rubbish from the site. Surplus soil may be deposited in embankments, shoulders, or as directed by the RPR. Except for paved areas of the airport, the Contractor shall restore all disturbed areas to their original condition.

METHOD OF MEASUREMENT

705-4.1 The length of perforated PVC pipe shall be the number of linear feet of pipe underdrains in place, completed, and approved; measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The several classes, types, and sizes shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipeline being measured. Porous backfill and filter fabric shall be incidental.

705-4.2 Underdrain pipe cleanout shall be measured per each installed, completed, and approved.

BASIS OF PAYMENT

705-5.1 Pipe underdrains, complete. Pipe underdrains, complete (including excavation, bedding, porous backfill, pipe fittings, and all appearances) shall be made at the contract unit price per linear foot complete (including porous backfill and filter fabric). These prices shall be full compensation for furnishing all materials and for all preparation, excavation, off-haul, and disposal of excess material, bedding, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

705-5.2 Underdrain pipe cleanout will be paid for at the contract unit price per each in place when completed. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials including filter fabric, wyes, tees, pipes, fittings, castings, and encasement; furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the item as shown on the plans; and for all labor equipment, tools and incidentals necessary to complete the cleanout.

Payment will be made under:

Item D-705-5.1	Underdrain Pipe, 6” Perforated – per linear foot
Item D-705-5.2	Underdrain Pipe Cleanout – per each

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM F758	Standard Specification for Smooth Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M288	Standard Specification for Geotextile Specification for Highway Applications

AASHTO Standard Specifications for Highway Bridges

END OF ITEM D-705

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Item D-751 Manholes, Catch Basins, Inlets and Inspection Holes

DESCRIPTION

751-1.1 This item shall consist of construction of manholes, catch basins, inlets, and inspection holes, in accordance with these specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the plans or required by the RPR.

MATERIALS

751-2.1 Brick. Not used.

751-2.2 Mortar. Mortar shall consist of one part Portland cement and two parts sand. The cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

751-2.3 Concrete. Plain and reinforced concrete used in structures, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of Item P-610.

751-2.4 Precast concrete pipe manhole rings. Precast concrete pipe manhole rings shall conform to the requirements of ASTM C478. Unless otherwise specified, the risers and offset cone sections shall have an inside diameter of not less than 36 inches nor more than 48 inches. There shall be a gasket between individual sections and sections cemented together with mortar on the inside of the manhole. Gaskets shall conform to the requirements of ASTM C443.

751-2.5 Corrugated metal. Corrugated metal shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M36.

751-2.6 Frames, covers, and grates. The castings shall conform to one of the following requirements:

a. ASTM A48, Class 35B: Gray iron castings

b. ASTM A47: Malleable iron castings

c. ASTM A27: Steel castings

d. ASTM A283, Grade D: Structural steel for grates and frames

e. ASTM A536, Grade 65-45-12: Ductile iron castings

f. ASTM A897: Austempered ductile iron castings

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings, aircraft gear configuration and/or direct loading, specified.

Each frame and cover or grate unit shall be provided with fastening members to prevent it from being dislodged by traffic but will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

751-2.7 Steps. The steps or ladder bars shall be gray or malleable cast iron or galvanized steel. The steps shall be the size, length, and shape shown on the plans and those steps that are not galvanized shall be given a coat of asphalt paint, when directed.

751-2.8 Precast inlet structures. Manufactured in accordance with and conforming to ASTM C913.

CONSTRUCTION METHODS

751-3.1 Unclassified excavation

a. The Contractor shall excavate for structures and footings to the lines and grades or elevations, shown on the plans, or as staked by the RPR. The excavation shall be of sufficient size to permit the placing of the

full width and length of the structure or structure footings shown. The elevations of the bottoms of footings, as shown on the plans, shall be considered as approximate only; and the RPR may direct, in writing, changes in dimensions or elevations of footings necessary for a satisfactory foundation.

b. Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the RPR. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. Where concrete will rest on a surface other than rock, the bottom of the excavation shall not be disturbed and excavation to final grade shall not be made until immediately before the concrete or reinforcing is placed.

c. The Contractor shall do all bracing, sheathing, or shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for the structure.

d. All bracing, sheathing, or shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. The cost of removal shall be included in the unit price bid for the structure.

e. After excavation is completed for each structure, the Contractor shall notify the RPR. No concrete or reinforcing steel shall be placed until the RPR has approved the depth of the excavation and the character of the foundation material.

751-3.2 Brick structures. Not used.

751-3.3 Concrete structures. Concrete structures which are to be cast-in-place within the project boundaries shall be built on prepared foundations, conforming to the dimensions and shape indicated on the plans. The construction shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the RPR before the concrete is placed.

All invert channels shall be constructed and shaped accurately to be smooth, uniform, and cause minimum resistance to flowing water. The interior bottom shall be sloped to the outlet.

751-3.4 Precast concrete structures. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program.

Precast concrete structures shall conform to ASTM C478. Precast concrete structures shall be constructed on prepared or previously placed slab foundations conforming to the dimensions and locations shown on the plans. All precast concrete sections necessary to build a completed structure shall be furnished. The different sections shall fit together readily. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall: (1) be smoothed to a uniform surface on both interior and exterior of the structure or (2) utilize a rubber gasket per ASTM C443. The top of the upper precast concrete section shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or other cap, as required. Provision shall be made for any connections for lateral pipe, including drops and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause minimum resistance to flow. The metal or metal encapsulated steps that are embedded or built into the side walls shall be aligned and placed in accordance to ASTM C478. When a metal ladder replaces the steps, it shall be securely fastened into position.

751-3.5 Corrugated metal structures. Corrugated metal structures shall be prefabricated. All standard or special fittings shall be furnished to provide pipe connections or branches with the correct dimensions and of sufficient length to accommodate connecting bands. The fittings shall be welded in place to the metal structures. The top of the metal structure shall be designed so that either a concrete slab or metal collar may be attached to allow the fastening of a standard metal frame and grate or cover. Steps or ladders shall be furnished as shown on the plans. Corrugated metal structures shall be constructed on prepared foundations, conforming to the dimensions and locations as shown on the plans. When indicated, the structures shall be placed on a reinforced concrete base.

751-3.6 Inlet and outlet pipes. Inlet and outlet pipes shall extend through the walls of the structures a sufficient distance beyond the outside surface to allow for connections. They shall be cut off flush with the wall on the inside surface of the structure, unless otherwise directed. For concrete or brick structures, mortar shall be placed around these pipes to form a tight, neat connection.

751-3.7 Placement and treatment of castings, frames, and fittings. All castings, frames, and fittings shall be placed in the positions indicated on the plans or as directed by the RPR, and shall be set true to line and elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

After the frames or fittings have been set in final position, the concrete or mortar shall be allowed to harden for seven (7) days before the grates or covers are placed and fastened down.

751-3.8 Installation of steps. The steps shall be installed as indicated on the plans or as directed by the RPR. When the steps are to be set in concrete, they shall be placed and secured in position before the concrete is placed. The steps shall not be disturbed or used until the concrete or mortar has hardened for at least seven (7) days. After seven (7) days, the steps shall be cleaned and painted, unless they have been galvanized.

When steps are required with precast concrete structures, they shall meet the requirements of ASTM C478. The steps shall be cast into the side of the sections at the time the sections are manufactured or set in place after the structure is erected by drilling holes in the concrete and cementing the steps in place.

Instead of steps, prefabricated ladders may be installed. For brick or concrete structures, the ladder shall be held in place by grouting the supports in drilled holes. For metal structures, the ladder shall be secured by welding the top support to the structure and grouting the bottom support into drilled holes in the foundation or as directed by the RPR.

751-3.9 Backfilling

a. After a structure has been completed, the area around it shall be backfilled with approved material, in horizontal layers not to exceed 8 inches in loose depth and compacted to the density required in Item P-152. Each layer shall be deposited evenly around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the RPR.

b. Backfill shall not be placed against any structure until approved by the RPR. For concrete structures, approval shall not be given until the concrete has been in place seven (7) days, or until tests establish that the concrete has attained sufficient strength to withstand any pressure created by the backfill and placing methods.

c. Backfill shall not be measured for direct payment. Performance of this work shall be considered an obligation of the Contractor covered under the contract unit price for the structure involved.

751-3.10 Cleaning and restoration of site. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, or as approved by the RPR. The Contractor shall restore all disturbed areas to their original condition. The Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

METHOD OF MEASUREMENT

751-4.1 Manholes, catch basins, connections to existing basins, inlets, grade adjustments, and inspection holes shall be measured by the unit. Joints, joint seal, concrete, rebar, dowels, frames, grates, and demolition required for connections, shall not be measured separately and are considered incidental.

BASIS OF PAYMENT

751-5.1 The accepted quantities of manholes, catch basins, connections to existing basins, grade adjustments, inlets, and inspection holes will be paid for at the contract unit price per each in place when

completed. This price shall be full compensation for furnishing all materials and for all preparation, excavation, off-haul, and disposal of excess material, bedding, backfilling and placing of the materials; furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the item as shown on the plans; new manhole connections atop existing pipes; and for all labor equipment, tools and incidentals necessary to complete the structure.

Payment will be made under:

Item D-751-5.1	48” Stormdrain Manhole – per each
Item D-751-5.2	Catch Basin / Drop Inlet – per each
Item D-751-5.3	Adjust Catch Basin to Grade – per each
Item D-751-5.4	Connect to Existing Manhole/Basin – per each

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C913	Standard Specification for Precast Concrete Water and Wastewater Structures.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M36	Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains

END OF ITEM D-751

Item D-754 Concrete Gutters, Ditches, and Flumes

DESCRIPTION

754-1.1 This item shall consist of Portland cement concrete gutters, ditches, and flumes constructed in accordance with these specifications at the specified locations in accordance with the dimensions, lines, and grades as shown on the plans.

MATERIALS

754-2.1 Concrete. Plain and reinforced concrete shall meet the requirements of Item P-610.

754-2.2 Joints. Joint filler materials and premolded joint material shall conform to Item P-605.

CONSTRUCTION METHODS

754-3.1 Preparing subgrade. Excavation shall be made to the required width and depth, and the subgrade upon which the item is to be built shall be compacted to a firm uniform grade. All soft and unsuitable material shall be removed and replaced with suitable approved material. When required, a layer of approved granular material, compacted to the thickness indicated on the plans, shall be placed to form a subbase. The underlying course shall be checked and accepted by the RPR before placing and spreading operations are started.

754-3.2 Placing. The forms and the mixing, placing, finishing, and curing of concrete shall conform to the requirements of Item P-610 and the following requirements.

The concrete shall be tamped until it is consolidated and mortar covers the top surface. The surface of the concrete shall be floated smooth and the edges rounded to the radii shown on the plans. Before the concrete is given the final finishing, the surface shall be tested with a 12-foot straightedge, and any irregularities of more than 1/4 inch in 12-foot shall be eliminated.

The concrete shall be placed with dummy-grooved joints not to exceed 8 feet apart.

Expansion joints of the type called for in the plans shall be constructed to replace dummy groove joints at a spacing of approximately 100 feet. When the gutter is placed next to concrete pavement, expansion joints in the gutter shall be located opposite expansion joints in the pavement. When a gutter abuts a pavement or other structure, an expansion joint shall be placed between the gutter and the other structure.

Forms shall not be removed within 24 hours after the concrete has been placed. Minor defects shall be repaired with mortar containing one (1) part cement and two (2) parts fine aggregate.

Depositing, compacting, and finishing the item shall be conducted to build a satisfactory structure. If any section of concrete is found to be porous, or is otherwise defective, it shall be removed and replaced by the Contractor without additional compensation.

754-3.3 Backfilling. After the concrete has set sufficiently, the spaces adjacent to the structure shall be refilled to the required elevation with material specified on the plans and compacted by mechanical equipment to at least 90% of the maximum density as determined by ASTM D698. The in-place density shall be determined in accordance with ASTM D1556.

754-3.4 Cleaning and restoration of site. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, hauled off-site, or as ordered by the RPR. The Contractor shall restore all disturbed areas to their original condition. The Contractor shall remove all tools and equipment, leaving the entire site free, clear and in good condition.

Performance of the work described in this section shall be considered as a subsidiary obligation of the Contractor, covered under the contract unit price for the structure.

METHOD OF MEASUREMENT

754-4.1 Concrete shall be measured by the linear foot. No deductions shall be made for the volume occupied by reinforcing steel, anchors, conduits, weep holes, or piling.

754-4.2 Reinforcing steel shall be incidental to the cost of concrete. No separate measurement shall be made.

BASIS OF PAYMENT

754-5.1 The accepted quantities of structural concrete will be paid for at the contract unit price per linear foot, complete in place. Concrete apron shall be measured in a straight line through the catch basin.

Payment will be made under:

Item D-754-5.1	Construct Concrete Valley Gutter and Apron - per linear foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3 (600 kN-m/m^3))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

END OF ITEM D-754

Item T-901 Seeding

DESCRIPTION

901-1.1 This item shall consist of soil preparation, seeding, and fertilizing the areas shown on the plans or as directed by the RPR in accordance with these specifications.

MATERIALS

901-2.1 Seed. The species and application rates of grass, legume, and cover-crop seed furnished shall be those stipulated herein. Seed shall conform to the requirements of Federal Specification JJJ-S-181, Federal Specification, Seeds, Agricultural.

Seed shall be furnished separately or in mixtures in standard containers labeled in conformance with the Agricultural Marketing Service (AMS) Seed Act and applicable state seed laws with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the RPR duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within six (6) months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed. Wet, moldy, or otherwise damaged seed will be rejected.

Seeds shall be applied as follows:

Seed Properties and Rate of Application

Component	Rate of Application lb./acre (or lb./1,000 S.F.)
Vulpir Myuros (14%)	8
Blando Brome (34%)	20
Trifolium Hirtum (52%)	30
Mulch	2,000
M-Binder	200
Commercial Fertilizer	300

901-2.2 Lime. Not required.

901-2.3 Fertilizer. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

a. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or

b. Fertilizers shall be 22-10-5 commercial fertilizer and shall be spread at the rate of 200-lb per acre.

901-2.4 Soil for repairs. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from

large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the RPR before being placed.

CONSTRUCTION METHODS

901-3.1 Advance preparation and cleanup. After grading of areas has been completed and before applying fertilizer and ground limestone, areas to be seeded shall be raked or otherwise cleared of stones larger than 2 inches in any diameter, sticks, stumps, and other debris that might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it has recently been thoroughly loosened and worked to a depth of not less than 5 inches as a result of grading operations and, if immediately prior to seeding, the top 3 inches of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and if shaped to the required grade.

When the area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds shall first be cut or otherwise satisfactorily disposed of, and the soil then scarified or otherwise loosened to a depth not less than 5 inches. Clods shall be broken and the top 3 inches of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

901-3.2 Dry application method. Not used.

901-3.3 Wet application method

a. General. The Contractor may elect to apply seed and fertilizer (and lime, if required) by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by using the methods and equipment described herein. The rates of application shall be as specified in the special provisions.

b. Spraying equipment. The spraying equipment shall have a container or water tank equipped with a liquid level gauge, calibrated to read in increments not larger than 50 gallons over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical, power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering 100 gallons per minute at a pressure of 100 lb. / sq. inch. The pump shall be mounted in a line that will recirculate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipe lines shall be capable of providing clearance for 5/8 inch solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over distances varying from 20 to 100 feet. One shall be a close-range ribbon nozzle, one a medium-range ribbon nozzle, and one a long-range jet nozzle. For case of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet in length shall be provided to which the nozzles may be connected.

c. Mixtures. Lime, if required, shall be applied separately, in the quantity specified, prior to the fertilizing and seeding operations. Not more than 220 pounds of lime shall be added to and mixed with each 100 gallons (380 liters) of water. Seed and fertilizer shall be mixed together in the relative proportions specified,

but not more than a total of 220 pounds of these combined solids shall be added to and mixed with each 100 gallons of water.

All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. The Contractor shall identify to the RPR all sources of water at least two (2) weeks prior to use. The RPR may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source that is disapproved by the RPR following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within two (2) hours from the time they were mixed or they shall be wasted and disposed of at approved locations.

d. Spraying. Lime, if required, shall be sprayed only upon previously prepared seedbeds. After the applied lime mixture has dried, the lime shall be worked into the top 3 inches, after which the seedbed shall again be properly graded and dressed to a smooth finish.

Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds on which the lime, if required, shall already have been worked in. The mixtures shall be applied by means of a high-pressure spray that shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to ensure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known area.

Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

On surfaces that are to be mulched as indicated by the plans or designated by the RPR, seed and fertilizer applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

901-3.4 Maintenance of seeded areas. The Contractor shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the RPR. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding, as directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

When either the dry or wet application method outlined above is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density to the satisfaction of the RPR. A grass stand shall be considered adequate when bare spots are one square foot or less, randomly dispersed, and do not exceed 3% of the area seeded.

METHOD OF MEASUREMENT

901-4.1 The quantity of hydroseeding to be paid for shall be the number of acres measured on the ground surface, completed and accepted.

BASIS OF PAYMENT

901-5.1 Payment shall be made at the contract unit price per acre or fraction thereof, which price and payment shall be full compensation for furnishing and placing all material, including seeds, binder, and fertilizer, and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Payment will be made under:

Item T-901-5.1 Hydroseed - per acre

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C602 Standard Specification for Agricultural Liming Materials

Federal Specifications (FED SPEC)

FED SPEC JJJ-S-181, Federal Specification, Seeds, Agricultural

Advisory Circulars (AC)

AC 150/5200-33 Hazardous Wildlife Attractants on or Near Airports

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

END OF ITEM T-901

Item T-905 Topsoil

DESCRIPTION

905-1.1 This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the RPR.

MATERIALS

905-2.1 Topsoil. Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches or more in diameter), and clay lumps or similar objects. Brush and other vegetation that will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sod and herbaceous growth such as grass and weeds are not to be removed, but shall be thoroughly broken up and intermixed with the soil during handling operations. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means, shall be removed. The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the Association of Official Agricultural Chemists in effect on the date of invitation of bids. The organic content shall be not less than 3% nor more than 20% as determined by the wet-combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% of the material passing the 200 mesh sieve as determined by the wash test in accordance with ASTM C117.

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications.

905-2.2 Inspection and tests. Within 10 days following acceptance of the bid, the RPR shall be notified of the source of topsoil to be furnished by the Contractor. The topsoil shall be inspected to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths, for testing purposes as specified in paragraph 905-2.1.

CONSTRUCTION METHODS

905-3.1 General. Areas to be topsoiled shall be shown on the plans. If topsoil is available on the site, the location of the stockpiles or areas to be stripped of topsoil and the stripping depths shall be shown on the plans.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the RPR before the various operations are started.

905-3.2 Preparing the ground surface. Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other means approved by the RPR, to a minimum depth of 2 inches to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of capillary moisture, or the proper growth of the desired planting. Limited areas, as shown on the plans, which are too compact to respond to these operations shall receive special scarification.

Grades on the area to be topsoiled, which have been established by others as shown on the plans, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and compacted condition to prevent the formation of low places or pockets where water will stand.

905-3.3 Obtaining topsoil. Prior to the stripping of topsoil from designated areas, any vegetation, briars, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the RPR. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the RPR. The topsoil shall be spread on areas already tilled and smooth-graded, or stockpiled in areas approved by the RPR. Any topsoil stockpiled by the Contractor shall be rehandled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoil purposes, shall be removed and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

905-3.4 Placing topsoil. The topsoil shall be evenly spread on the prepared areas to a uniform depth of 2 inches after compaction, unless otherwise shown on the plans or stated in the special provisions. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (2 inches or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. after spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the RPR. The compacted topsoil surface shall conform to the required lines, grades, and cross-sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

METHOD OF MEASUREMENT

905-4.1 Topsoil is optional, contractor recommended to evaluate existing subsurface soils with proposed seed mix compatibility. No separate measurement will be made for topsoil. Topsoil shall be incidental to the item requiring it.

BASIS OF PAYMENT

905-5.1 No separate payment will be made for topsoil. Topsoil shall be incidental to the item requiring it.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C117	Materials Finer than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing

Advisory Circulars (AC)

AC 150/5200-33	Hazardous Wildlife Attractants on or Near Airports

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

END OF ITEM T-905

Item L-108 Underground Power Cable for Airports

DESCRIPTION

108-1.1 This item shall consist of furnishing and installing power cables that are direct buried and furnishing and/or installing power cables within conduit or duct banks per these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the RPR. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of cable for FAA owned/operated facilities.

EQUIPMENT AND MATERIALS

108-2.1 General.

a. Airport lighting equipment and materials covered by advisory circulars (AC) shall be approved under the Airport Lighting Equipment Certification Program per AC 150/5345-53, current version.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the RPR.

c. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the RPR) and replaced with materials that comply with these specifications at the Contractor's cost.

d. All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications, electronically submitted in pdf format, tabbed by specification section. The RPR reserves the right to reject any and all equipment, materials, or procedures that do not meet the system design and the standards and codes, specified in this document.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. The Contractor shall maintain a minimum insulation resistance in accordance with paragraph 108-3.10e with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period when tested in accordance with AC 150/5340-26, Maintenance Airport Visual Aid Facilities, paragraph 5.1.3.1, Insulation Resistance Test.

108-2.2 Cable. Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge (AWG), L-824 Type C 5,000 volts,

non-shielded, with cross-linked polyethylene insulation. L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer's recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Commercial Item Description A-A-59544A and shall be type THWN-2, 75°C for installation in conduit and RHW-2, 75°C for direct burial installations. Conductors for parallel (voltage) circuits shall be type and size and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600-volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600-volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600-volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective pay items provided.

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Document.

108-2.3 Bare copper wire (counterpoise, bare copper wire ground and ground rods). Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG bare solid copper wire for counterpoise and/or No. 6 AWG insulated stranded for grounding bond wire per ASTM B3 and ASTM B8, and shall be bare copper wire per ASTM B33. For voltage powered circuits, the equipment grounding conductor shall comply with NEC Article 250.

Counterpoise for MALSF conduit and base can installation shall be No. 1/0 AWG bare, stranded copper wire. Ground rods for MALSF installation shall be installed every 90' +/- 20%. See sheet E-605 for MALSF conduit and base can schematic and MALSF counterpoise installation details.

Ground rods shall be copper-clad steel**.** The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 10 feet long and 3/4 inch in diameter.

108-2.4 Cable connections. In-line connections or splices of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

a. The cast splice. A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by 3M™ Company, "Scotchcast" Kit No. 82-B, or an approved equivalent, used for potting the splice is acceptable for 600-volt circuits only.

b. The field-attached plug-in splice. Field attached plug-in splices shall be installed as shown on the plans. The Contractor shall determine the outside diameter of the cable to be spliced and furnish appropriately sized connector kits and/or adapters. Tape or heat shrink tubing with integral sealant shall be in accordance with the manufacturer's requirements. Primary Connector Kits manufactured by Amerace, "Super Kit", Integro "Complete Kit", or approved equal is acceptable.

c. The factory-molded plug-in splice. Specification for L-823 Connectors, Factory-Molded to Individual Conductors, is acceptable.

d. The taped or heat-shrink splice. Not Used.

108-2.5 Splicer qualifications. Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the

RPR proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

108-2.6 Concrete. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

108-2.7 Flowable backfill. Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

108-2.8 Cable identification tags. Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

108-2.9 Tape. Electrical tapes shall be Scotch™ Electrical Tapes –Scotch™ 88 (1-1/2 inch wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M™), or an approved equivalent.

108-2.10 Electrical coating. Electrical coating shall be Scotchkote™ as manufactured by 3M™, or an approved equivalent.

108-2.11 Existing circuits. Whenever the scope of work requires connection to an existing circuit, the existing circuit's insulation resistance shall be tested, in the presence of the RPR. The test shall be performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall record the results on forms acceptable to the RPR. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the RPR. The Contractor shall record the results on forms acceptable to the RPR. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the existing circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual

108-2.12 Detectable warning tape. Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend tape shall be polyethylene film with a metalized foil core and shall be 3-6 inches wide. Detectable tape is incidental to the respective bid item. Detectable warning tape for communication cables shall be orange. Detectable warning tape color code shall comply with the APWA Uniform Color Code.

CONSTRUCTION METHODS

108-3.1 General. The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Cable shall be run without splices, from fixture to fixture.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections unless otherwise authorized in writing by the RPR or shown on the plans.

In addition to connectors being installed at individual isolation transformers, L-823 cable connectors for maintenance and test points shall be installed at locations shown on the plans. Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed and on both sides of slack loops where a future connector would be installed.

Provide not less than 3 feet of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one

foot vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light bases, junction boxes, and access structures to allow for future connections, or as designated by the RPR.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch (6 mm) in size. The cable circuit identification shall match the circuits noted on the construction plans.

108-3.2 Installation in duct banks or conduits. This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.

Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor's expense. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the RPR of any blockage in the existing ducts.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer's recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the RPR prior to any cable installation. If required by the RPR, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the RPR. Cable pull tensions shall be recorded by the Contractor and reviewed by the RPR. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations. During cold weather, particular attention shall be paid to the manufacturer's minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer's minimum installation temperature. At the Contractor's option, the Contractor may submit a plan, for review by the RPR, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer's minimum cable installation temperature.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

108-3.3 Installation of direct-buried cable in trenches. Not Used.

108-3.4 Cable markers for direct-buried cable. Not Used.

108-3.5 Splicing. Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

a. Cast splices. These shall be used for 600-volt circuits only. They shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured per the manufacturer's instructions and to the satisfaction of the RPR.

b. Field-attached plug-in splices. These shall be assembled per the manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by the following method: on connector kits equipped with water seal flap, roll-over water seal flap to sealing position on mating connector, then wrap with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 2 inches on each side of the joint.

c. Factory-molded plug-in splices. See details on plans to connect isolation transformers to splice kits.

d. Taped or heat-shrink splices. Not Used.

e. Assembly. Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch (6.4 mm) beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

108-3.6 Bare counterpoise wire installation for lightning protection and grounding. Bare solid #6 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The RPR shall select one of two methods of lightning protection for the airfield lighting circuit based upon sound engineering practice and lightning strike density. MALSF counterpoise shall use #1/0 bare copper cable and install per details on plans.

a. Equipotential. –The counterpoise size is indicated above. The equipotential method is applicable to all airfield lighting systems; i.e. runway, taxiway, apron – touchdown zone, centerline, edge, threshold and approach lighting systems. The equipotential method is also successfully applied to provide lightning protection for power, signal and communication systems. The light bases, counterpoise, etc. – all components - are bonded together and bonded to the vault power system ground loop/electrode.

Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables. The counterpoise is centered over the cable/conduit/duct to be protected.

The counterpoise conductor shall be installed no less than 8 inches minimum or 12 inches maximum above the raceway or cable to be protected, except as permitted below:

(1) The minimum counterpoise conductor height above the raceway or cable to be protected shall be permitted to be adjusted subject to coordination with the airfield lighting and pavement designs.

(2) The counterpoise conductor height above the protected raceway(s) or cable(s) shall be calculated to ensure that the raceway or cable is within a 45-degree area of protection, (45 degrees on each side of vertical creating a 90 degree angle).

The counterpoise conductor shall be bonded to each metallic light base, mounting stake, and metallic airfield lighting component.

All metallic airfield lighting components in the field circuit on the output side of the constant current regulator (CCR) or other power source shall be bonded to the airfield lighting counterpoise system.

All components rise and fall at the same potential; with no potential difference, no damaging arcing and no damaging current flow.

See AC 150/5340-30, Design and Installation Details for Airport Visual Aids and NFPA 780, Standard for the Installation of Lightning Protection Systems, Chapter 11, for a detailed description of the Equipotential Method of lightning protection.

Reference FAA STD-019F, Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment, Part 4.1.1.7.

b. Isolation –. Counterpoise size is as specified above. The isolation method is an alternate method for use only with edge lights installed in turf and stabilized soils and raceways installed parallel to and adjacent to the edge of the pavement. NFPA 780 uses 15 feet to define “adjacent to”.

The counterpoise conductor shall be installed as indicated on the plans between the pavement edge and the light base, mounting stake, raceway, or cable being protected.

The counterpoise conductor shall be installed 8 inches (203 mm) minimum below grade. The counterpoise is not connected to the light base or mounting stake. An additional grounding electrode is required at each light base or mounting stake. The grounding electrode is bonded to the light base or mounting stake with a 6 AWG solid copper conductor.

See AC 150/5340-30, Design and Installation Details for Airport Visual Aids and NFPA 780, Standard for the Installation of Lightning Protection Systems, Chapter 11, for a detailed description of the Isolation Method of lightning protection.

c. Common Installation requirements. When a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

Nonmetallic light base shall not be used.

Grounding electrodes may be rods, ground dissipation plates, radials, or other electrodes listed in the NFPA 70 (NEC) or NFPA 780.

Where raceway is installed by the directional bore, jack and bore, or other drilling method, the counterpoise conductor shall be permitted to be installed concurrently with the directional bore, jack and bore, or other drilling method raceway, external to the raceway or sleeve.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

Counterpoise for the MALSF system shall have ground rods installed every 90' +/- 20%.

d. Parallel Voltage Systems. Provide grounding and bonding in accordance with NFPA 70, National Electric Code.

108-3.7 Counterpoise installation above multiple conduits and duct banks. Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete area of protection measured 45 degrees each side of vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

108-3.8 Counterpoise installation at existing duct banks. When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

108-3.9 Exothermic bonding. Bonding of counterpoise wire shall be by the exothermic welding process or equivalent method accepted by the RPR. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the RPR, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

a. All slag shall be removed from welds.

b. Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not recommended unless the base has been specially modified. Consult the manufacturer's installation directions for proper methods of bonding copper wire to the light base. See AC 150/5340-30 for galvanized light base exception.

c. If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

108-3.10 Testing. The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the RPR. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the RPR. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

a. Earth resistance testing methods shall be submitted to the RPR for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the RPR. All such testing shall be at the sole expense of the Contractor.

b. Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The RPR shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the RPR the following:

c. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.

d. That all affected circuits (existing and new) are free from unspecified grounds.

e. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 500 megohms. Verify continuity of all series airfield lighting circuits prior to energization.

f. That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits or circuit segments is not less than 100 megohms.

g. That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.

h. That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

i. That the impedance to ground of each ground rod does not exceed 25 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as

described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters may be used to satisfy the impedance testing requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the RPR prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the RPR. Where connecting new cable to existing cable, insulation resistance tests shall be performed on the new cable prior to connection to the existing circuit.

There are no approved "repair" procedures for items that have failed testing other than complete replacement.

METHOD OF MEASUREMENT

108-4.1 The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall be included in the unit price bid for the work. See L-110 for duct banks and conduit installation.

108-4.2 Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet installed and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. Cable and counterpoise slack is considered incidental to this item and is included in the Contractor's unit price. No separate measurement or payment will be made for cable or counterpoise slack.

108-4.3 No separate measurement will be made for ground rods.

BASIS OF PAYMENT

108-5.1 Payment will be made at the contract unit price for trenching, cable and bare counterpoise wire installed in trench (direct-buried), or cable and equipment ground installed in duct bank or conduit, in place by the Contractor and accepted by the RPR. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

Payment will be made under:

Item L-108-5.1	No. 8 AWG 5 kV, L-824, Type C Cable, Installed in Duct Bank or Conduit - per linear foot
Item L-108-5.2a	No. 6 AWG Bare Counterpoise Wire, Installed Adjacent to or Above the Duct Bank or Conduit, Including Ground Rods and Connections/Terminations - per linear foot
Item L-108-5.2b	No. 1/0 AWG Bare Counterpoise Wire for MALSF, Installed Adjacent to or Above the Duct Bank or Conduit, Including Ground Rods and Connections/Terminations - per linear foot.
Item L-108-5.3a	No. 4/0 AWG 600V, L-824, Type THWN-2 Cable for MALSF, Installed in Duct Bank or Conduit - per linear foot.
Item L-108-5.3b	No. 4 AWG 600V, L-824, Type THWN-2 Cable for MALSF, Installed in Duct Bank or Conduit - per linear foot.
Item L-108-5.3c	No. 6 AWG 600V, L-824, Type THWN-2 Cable for MALSF, Installed in Duct Bank or Conduit - per linear foot.
Item L-108-5.3d	No. 2 AWG 600V, L-824, Type THWN-2 Cable for MALSF, Installed in Duct Bank or Conduit - per linear foot.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description

A-A-59544A	Cable and Wire, Electrical (Power, Fixed Installation)
A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

ASTM International (ASTM)

ASTM B3	Standard Specification for Soft or Annealed Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes
ASTM D4388	Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes

Mil Spec

MIL-PRF-23586F	Performance Specification: Sealing Compound (with Accelerator), Silicone Rubber, Electrical
MIL-I-24391	Insulation Tape, Electrical, Plastic, Pressure Sensitive

National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)
NFPA-780	Standard for the Installation of Lightning Protection Systems

American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

Federal Aviation Administration Standard

FAA STD-019F	Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment
FAA STD-C-1391E	Installation, Termination, Splicing, and Transient/Surge Protection of Underground Electrical Distribution System Power Cables

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Item L-110 Airport Underground Electrical Duct Banks and Conduits

DESCRIPTION

110-1.1 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

EQUIPMENT AND MATERIALS

110-2.1 General.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the RPR.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR and replaced with materials, that comply with these specifications, at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section. The RPR reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

110-2.2 Steel conduit. Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10-mil thick coat of asphaltum sealer or shall have a factory-bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10 mils of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions. In lieu of PVC coated RGS, corrosion wrap tape shall be permitted to be used where RGS is in contact with direct earth."

110-2.3 Plastic conduit. Plastic conduit and fittings-shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high-density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

a. Type I–Schedule 40 and Schedule 80 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II–Schedule 40 PVC suitable for either above ground or underground use.

c. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.

d. Type III –HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

110-2.4 Split conduit. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

110-2.5 Conduit spacers. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads. They shall be designed to accept No. 4 reinforcing bars installed vertically.

110-2.6 Concrete. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

110-2.7 Precast concrete structures. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program. Precast concrete structures shall conform to ASTM C478.

110-2.8 Flowable backfill. Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

110-2.9 Detectable warning tape. Plastic, detectable, American Public Works Association (APWA) red (electrical power lines, cables, conduit and lighting cable), orange (telephone/fiber optic cabling) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

110-3.1 General. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The RPR shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the

grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. Under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade; in other locations, the top of the duct bank or underground conduit shall be be not less than 18 inches (0.5 m) below finished grade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the RPR of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200-pound (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet (1.5 m).

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6.3 mm) sieve. Flowable backfill may alternatively be used

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the RPR. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is

placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet (60 cm).

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the RPR, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Additional duct bank supports shall be installed, as approved by the RPR.

All excavation shall be unclassified and shall be considered incidental to Item L-110. Dewatering necessary for duct installation, and erosion per federal, state, and local requirements is incidental to Item L-110.

Unless otherwise specified, excavated materials that are deemed by the RPR to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the RPR and compacted per Item P-152.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables) cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

a. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred

b. Trenching, etc., in cable areas shall then proceed with approval of the RPR, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

110-3.2 Duct banks. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (0.5 m) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (0.5 m) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (1 m) beyond the edges of the pavement or 3 feet (1 m) beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. The Contractor shall space the conduits not less than 3 inches (75 mm) apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the

plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot (1.5-m) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the RPR shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the RPR.

110-3.3 Conduits without concrete encasement. Trenches for single-conduit lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4-inch (6.3 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport's secured area where trespassing is prohibited are at least 18 inches (0.5 m) below the finished grade. Conduits outside the Airport's secured area shall be installed so that the tops of the conduits are at least 24 inches (60 cm) below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and lot less than 6 inches (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

110-3.4 Markers. Not used.

110-3.5 Backfilling for conduits. For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

110-3.6 Backfilling for duct banks. After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 “Excavation and Embankment” except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition to the requirements of Item P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet (76 m) of duct bank or one work period’s construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

110-3.7 Restoration. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include seeding as shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

110-3.8 Ownership of removed cable. Removed cable shall become the property of the contractor, to be disposed of off site.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear feet of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated material, and restoration, and for drain lines, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

BASIS OF PAYMENT

110-5.1 Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, excavation, off-haul, and disposal of excavated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for removal and disposal of existing duct banks and conduits as shown on the plans, furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item per the provisions and intent of the plans and specifications.

Payment will be made under:

Item L-110-5.1	Concrete Encased Electrical Duct Bank, 1W - 2" Conduit - per linear foot
Item L-110-5.2	Concrete Encased Electrical Duct Bank, 3W - 2" Conduit - per linear foot
Item L-110-5.3	Concrete Encased Electrical Duct Bank, 5W - 2" Conduit - per linear foot
Item L-110-5.4	Concrete-Encased Electrical Duct Bank, 1W - 2" RGS Conduit – per linear foot
Item L-110-5.5	Non-Encased Electrical Duct Bank, 1W - 2" Conduit - per linear foot
Item L-110-5.6	Non-Encased Electrical Duct Bank, 2W - 2" Conduit - per linear foot

Item L-110-5.7	Non-Encased Electrical Duct Bank, 3W - 2" Conduit - per linear foot
Item L-110-5.8a	Non-Encased Electrical Duct Bank, 1W – 3” and 1W - 2" Conduit - per linear foot
Item L-110-5.8b	Non-Encased Electrical Duct Bank, 1W – 3” and 2W - 2" Conduit - per linear foot
Item L-110-5.8c	Non-Encased Electrical Duct Bank, 1W – 3” and 3W - 2" Conduit - per linear foot
Item L-110-5.9	Concrete Encase Existing FAA Line Under Proposed Pavement - per linear foot
Item L-110-5.10	Concrete Encase Existing FAA Line Outside Pavement - per linear foot
Item L-110-5.11	Lower and Concrete Encase FAA Line - per linear foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circular (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program

ASTM International (ASTM)

ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)

Underwriters Laboratories (UL)

UL Standard 6	Electrical Rigid Metal Conduit - Steel
UL Standard 514B	Conduit, Tubing, and Cable Fittings
UL Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL Standard 1242	Electrical Intermediate Metal Conduit Steel
UL Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL Standard 651A	Type EB and A Rigid PVC Conduit and HDPE Conduit

END OF ITEM L-110

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Item L-115 Electrical Manholes and Junction Structures

DESCRIPTION

115-1.1 This item shall consist of electrical manholes and junction structures (hand holes, pull boxes, junction cans, etc.) installed per this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the RPR. This item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the RPR including removal of existing manholes and junction structures as shown on the plans.

EQUIPMENT AND MATERIALS

115-2.1 General.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the RPR.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the RPR) and replaced with materials that comply with these specifications at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section. The RPR reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

115-2.2 Concrete structures. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures. Cast-in-place concrete structures shall be as shown on the plans.

115-2.3 Precast concrete structures. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another engineer approved third party certification program. Provide precast concrete structures where shown on the plans.

Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand 100,000 lb. aircraft wheel loading, 250 psi tire pressure, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown on the plans.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the RPR shall be submitted by the Contractor to allow for a full evaluation by the RPR. The RPR shall review per the process defined in the General Provisions.

115-2.4 Junction boxes. Junction boxes shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) airport light bases that are encased in concrete. The light bases shall have a blank cover, gasket, and stainless steel hardware. All bolts, studs, nuts, lock washers, and other similar fasteners used for the light fixture assemblies must be fabricated from 316L (equivalent to EN 1.4404), 18-8, 410, or 416 stainless steel. If 18-8, 410, or 416 stainless steel is utilized it shall be passivated and be free from any discoloration. Covers shall be 3/8-inch thickness for L-867 and 3/4-inch thickness for L-868. All junction boxes shall be provided with both internal and external ground lugs.

For cans used in MALSR installation, the L-868 shall use 1-1/4" thick lids to aid in can installation. The cans shall also be 15" for the MALSR installation.

115-2.5 Mortar. The mortar shall be composed of one part of cement and two parts of mortar sand, by volume. The cement shall be per the requirements in ASTM C150, Type I. The sand shall be per the requirements in ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C206. Water shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

115-2.6 Concrete. All concrete used in structures shall conform to the requirements of Item P-610, Concrete for Miscellaneous Structures.

115-2.7 Frames and covers. The frames shall conform to one of the following requirements:

a. ASTM A48 Gray iron castings

b. ASTM A47 Malleable iron castings

c. ASTM A27 Steel castings

d. ASTM A283, Grade D Structural steel for grates and frames

e. ASTM A536 Ductile iron castings

f. ASTM A897 Austempered ductile iron castings

All castings specified shall withstand a maximum tire pressure of 250 psi and maximum load of 100,000 lbs.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

Each cover shall have the word "ELECTRIC" or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

Each manhole shall be provided with a "DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER" safety warning sign as detailed in the Contract Documents and in accordance with OSHA 1910.146 (c)(2).

115-2.8 Ladders. Not used.

115-2.9 Reinforcing steel. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

115-2.10 Bedding/special backfill. Bedding or special backfill shall be as shown on the plans.

115-2.11 Flowable backfill. Flowable material used to backfill shall conform to the requirements of Item P-153, Controlled Low Strength Material.

115-2.12 Cable trays. Not used.

115-2.13 Plastic conduit. Plastic conduit shall comply with Item L-110, Airport Underground Electrical Duct Banks and Conduits.

115-2.14 Conduit terminators. Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

115-2.15 Pulling-in irons. Pulling-in irons shall be manufactured with 7/8-inch diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, 1/2-inch diameter with an ultimate strength of 270,000 psi). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

115-2.16 Ground rods. Ground rods shall be one-piece, tinned copper clad steel**.** The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 10 feet long nor less than 3/4 inch in diameter.

CONSTRUCTION METHODS

115-3.1 Unclassified excavation. It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the RPR without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the RPR. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to Item L-115. Dewatering necessary for structure installation and erosion per federal, state, and local requirements is incidental to Item L-115.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the RPR. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the RPR. Structures shall be placed after the RPR has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 inches of sand or a material approved by the RPR as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

115-3.2 Concrete structures. Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to

the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the RPR before the concrete is placed.

115-3.3 Precast unit installations. Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

115-3.4 Placement and treatment of castings, frames and fittings. All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the RPR and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written approval is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the RPR and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor's expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

115-3.5 Installation of ladders. Not used.

115-3.6 Removal of sheeting and bracing. In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than 6 inches of material is placed above the top of the structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The RPR may direct the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

115-3.7 Backfilling. After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 inches in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the RPR.

Backfill shall not be placed against any structure until approval is given by the RPR. In the case of concrete, such approval shall not be given until tests made by the laboratory under supervision of the RPR establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the RPR may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

115-3.8 Connection of duct banks. To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

115-3.9 Grounding. A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 inches above the floor. The ground rod shall be installed within one foot of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition

does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4-inch diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of one foot above the floor of the structure and separate from other cables. No. 2 American wire gauge (AWG) bare copper pigtails shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. Hardware connections may be mechanical, using a lug designed for that purpose.

FAA MALSF pull box shall have 2 ground rods, 10' on either side of the pull box, used by the guard wire. The #4/0 ground bus shall connect to one of these ground rods. The ground rod in the corner of the pull box shall be omitted. The guard wire shall connect to both of the ground rods, and route around the pull box.

115-3.10 Cleanup and repair. After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound per MIL-P-21035. Surfaces shall be prepared, and compound applied per the manufacturer's recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

115-3.11 Restoration. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective Item L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD) and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

115-3.12 Inspection. Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test per American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

115-3.13 Manhole elevation adjustments. The Contractor shall adjust the tops of existing manholes in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise or lower the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.

The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or shall cut the existing manhole walls to shorten the existing structure, as required by final grades. The Contractor shall reinstall the manhole top section or ring and cover on top and check the new top elevation.

The Contractor shall construct a concrete slab around the top of adjusted structures located in graded areas that are not to be paved. The concrete slab shall conform to the dimensions shown on the plans.

115-3.14 Duct extension to existing ducts. Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

METHOD OF MEASUREMENT

115-4.1 Electrical manholes and junction structures shall be measured by each unit completed in place and accepted. The following items shall be included in the price of each unit: All required excavation and dewatering; sheeting and bracing; all required backfilling with on-site materials; restoration of all surfaces and finished grading and turfing; all required connections; temporary cables and connections; and ground rod testing

115-4.2 Manhole elevation adjustments shall be measured by the completed unit installed, in place, completed, and accepted. Separate measurement shall not be made for the various types and sizes.

115-4.3 Construct MALSF Threshold or Centerline Bar shall be measured per each bar constructed, completed, and accepted by the engineer. Payment is per bar, not per light fixture installed.

BASIS OF PAYMENT

115-5.1 The accepted quantity of electrical manholes and junction structures will be paid for at the Contract unit price per each, complete and in place. Where conduits and cables are to be protected in place, the contractor has the option to cast the pullbox in place or install a pre-cast pullbox by removing cables to the next pull point and pull back once the pullbox is installed. Contractor shall verify/find power source. This price shall be full compensation for furnishing all materials and for all preparation, excavation, bedding, off-haul, and disposal of excavated material, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

115-5.2 Payment shall be made at the contract unit price for manhole elevation adjustments. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary, including but not limited to, spacers, concrete, rebar, dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required, to complete this item as shown in the plans and to the satisfaction of the RPR.

115-5.3 Payment shall be made at the contract unit price for MALSF Threshold and Centerline Bar Installation. This price shall include full compensation for installation of the salvaged light fixtures; and furnishing all materials, labor, equipment, tools, and incidentals necessary, including but not limited to, excavation, subgrade preparation, dewatering, bedding, preparation, assembly, joint sealing materials, concrete, reinforcing steel, hardware, base cans, conduit, testing, incidentals and associated items as are applicable for a complete and operating installation as shown in the plans and to the satisfaction of the RPR.

115-5.4 Payment shall be made at the contract unit price for manhole elevation adjustments. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary, including but not limited to, wire, cans, conduits, grade adjustments of existing foundations, light fixtures, spacers, concrete, rebar, dewatering, excavating, and backfill, where required, to complete this item as shown in the plans and to the satisfaction of the RPR

Payment will be made under:

Item L-115-5.1a	Construct Electrical Pullbox: Aircraft Rated - Per Each
Item L-115-5.1b	Construct FAA Pullbox - Per Each

Item L-115-5.1c	Construct Junction Can: L-868 with Lid - Per Each
Item L-115-5.1d	Adjust Junction Can to Grade - Per Each
Item L-115-5.2a	Adjust Electrical Pull Box to Grade - Per Each
Item L-115-5.2b	Adjust FAA Pull Box to Grade - Per Each
Item L-115-5.3a	Construct MALSF Threshold Bar - Per Each
Item L-115-5.3b	Construct MALSF Centerline Bar - Per Each

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

American National Standards Institute / Insulated Cable Engineers Association (ANSI/ICEA)

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

Advisory Circular (AC)

AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description (CID)

A-A 59544	Cable and Wire, Electrical (Power, Fixed Installation)

ASTM International (ASTM)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C206	Standard Specification for Finishing Hydrated Lime

FAA Engineering Brief (EB)

EB #83	In Pavement Light Fixture Bolts

Mil Spec

MIL-P-21035 Paint High Zinc Dust Content, Galvanizing Repair

National Fire Protection Association (NFPA)

NFPA-70 National Electrical Code (NEC)

END OF ITEM L-115

Item L-125 Installation of Airport Lighting Systems

DESCRIPTION

125-1.1 This item shall consist of airport lighting systems furnished and installed in accordance with this specification, the referenced specifications, and the applicable advisory circulars (ACs). The systems shall be installed at the locations and in accordance with the dimensions, design, and details shown in the plans. This item shall include the furnishing of all equipment, materials, services, and incidentals necessary to place the systems in operation as completed units to the satisfaction of the RPR.

EQUIPMENT AND MATERIALS

125-2.1 General.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified under the Airport Lighting Equipment Certification Program in accordance with AC 150/5345-53, current version. FAA certified airfield lighting shall be compatible with each other to perform in compliance with FAA criteria and the intended operation. If the Contractor provides equipment that does not performs as intended because of incompatibility with the system, the Contractor assumes all costs to correct the system for to operate properly.

b. Manufacturer's certifications shall not relieve the Contractor of their responsibility to provide materials in accordance with these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

c. All materials and equipment used shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Clearly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be clearly made with arrows or circles (highlighting is not acceptable). The Contractor shall be responsible for delays in the project accruing directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be submitted electronic PDF format. The RPR reserves the right to reject any or all equipment, materials or procedures, which, in the RPR’s opinion, does not meet the system design and the standards and codes, specified herein.

e. All equipment (except LED light sources) and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. LED light sources shall be guaranteed against defects in materials and workmanship for a period of at least forty-eight(48) months from final acceptance by the Owner light fixtures. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

125-2.2 Conduit/Duct. Conduit shall conform to Specification Item L-110 Airport Underground Electrical Duct Banks and Conduits.

125-2.3 Cable and Counterpoise. Cable and Counterpoise shall conform to Item L-108 Underground Power Cable for Airports.

125-2.4 Tape. Rubber and plastic electrical tapes shall be Scotch Electrical Tape Numbers 23 and 88 respectively, as manufactured by 3M Company or an approved equal.

125-2.5 Cable Connections. Cable Connections shall conform to Item L-108 Installation of Underground Cable for Airports.

125-2.6 Retroreflective Markers. Not used.

125-2.7 Runway and Taxiway Lights. Runway and taxiway lights shall conform to the requirements of AC 150/5345-46. Lamps shall be of size and type indicated, or as required by fixture manufacturer for each lighting fixture required under this contract. Filters shall be of colors conforming to the specification for the light concerned or to the standard referenced.

Lights

Type	Class	Mode	Style	Option	Base	Filter	Transformer	Notes
L-861(L)	2	1	NA	NA	L-867	NA	L-830, sized per manufacturer	LED
L-861E(L)	2	1	NA	NA	L-867	NA	L-830, sized per manufacturer	LED
L-861T(L)	2	1	NA	NA	L-867	NA	L-830, sized per manufacturer	LED
L-852D(L)	2	1	3	NA	L-868	NA	L-830, sized per manufacturer	LED
L-852T(L)	2	1	3	NA	L-868	NA	L-830, sized per manufacturer	LED

125-2.8 Runway and Taxiway Signs. Runway and Taxiway Guidance Signs should conform to the requirements of AC 150/5345-44.

Signs

Type	Size	Style	Class	Mode	Notes
L-858(L)	1	2	2	2	Guidance Signs.
L-858B(L)	5	2	2	2	Distance Remaining Signs.

125-2.9 Runway End Identifier Light (REIL). Contractor shall re-install salvaged REIL fixtures on new concrete foundations. The REILs shall be controlled as shown on the Plans.

125-2.11 Bird Spikes. Bird spikes shall be stainless steel and fastened to the perimeter of the top of signs to prevent birds resting on the sign. This item shall be incidental to the bid item.

125-2.12 Light Base and Transformer Housings. Light Base and Transformer Housings should conform to the requirements of AC 150/5345-42. Light bases shall be Type L-867 or L-868, Class 1A, Size B or C shall be provided as indicated or as required to accommodate the fixture or device installed thereon. Base plates, cover plates, and adapter plates shall be provided to accommodate various sizes of fixtures.

125-2.13 Isolation Transformers. Isolation Transformers shall be Type L-830, size as required for each installation. Transformer shall conform to AC 150/5345-47.

125-2.14 Miscellaneous Lighting Equipment. In addition to the fixture requirements, the Contractor shall provide the following miscellaneous lighting equipment:

a. Equipment for Runway

Elevated LED Medium Intensity Runway Light (MIRL)

5 Spare MIRL, L-861(L) complete light fixtures (include stem, base plate, and isolation transformer) ((2) WW, (2) WY, (1) YR)

10 Spare Frangible Couplings

Elevated LED Medium Intensity Threshold Light (MITHL)

6 Spare MITHL, L-861E(L) complete light fixtures (include stem, base plate, and isolation transformer) ((2) RR, (2) GR, (1) YG, (1) XG color)

In-pavement LED Medium Intensity Runway Light (MIRL)

1 Spare MIRL, L-852D(L) (WY color) (includes isolation transformer)

1 Spare MIRL, L-852D(L) (WW color) (includes isolation transformer)

LED Signs

10 Spare Frangible Couplings

6 Spare Isolation Transformers (2 per each mod)

6 Spare Light Engines, or Light Source (enough to fully relight the 2 largest signs installed in the project)

b. Equipment for Taxiways

Elevated LED Medium Intensity Taxiway Light (MITL)

5 Spare MITL, L-861T(L) complete light fixtures (include stem, base plate, and isolation transformer)

5 Spare MITL, L-861T(L) light engines (fixture only)

20 Spare Frangible Couplings

5 Spare Isolation Transformers

5 Spare Lens Assemblies (or 5 more light engines if only available as a single unit)

In-pavement LED Medium Intensity Taxiway Light (MITL)

5 Spare MITL, L-852T(L) light fixtures

5 Spare Isolation Transformers

INSTALLATION

125-3.1 Installation. The Contractor shall furnish, install, connect and test all equipment, accessories, conduit, cables, wires, buses, grounds and support items necessary to ensure a complete and operable airport lighting system as specified here and shown in the plans.

The equipment installation and mounting shall comply with the requirements of the National Electrical Code and state and local code agencies having jurisdiction.

The Contractor shall install the specified equipment in accordance with the applicable advisory circulars and the details shown on the plans.

125-3.2 Testing. All lights shall be fully tested by continuous operation for not less than 24 hours as a completed system prior to acceptance. The test shall include operating the constant current regulator in each step not less than 10 times at the beginning and end of the 24-hour test. The fixtures shall illuminate properly during each portion of the test.

125-3.3 Shipping and Storage. Equipment shall be shipped in suitable packing material to prevent damage during shipping. Store and maintain equipment and materials in areas protected from weather and physical damage. Any equipment and materials, in the opinion of the RPR, damaged during construction or storage shall be replaced by the Contractor at no additional cost to the owner. Painted or galvanized surfaces that are damaged shall be repaired in accordance with the manufacturer's recommendations.

125-3.4 Elevated and In-pavement Lights. Water, debris, and other foreign substances shall be removed prior to installing fixture base and light.

A jig or holding device shall be used when installing each light fixture to ensure positioning to the proper elevation, alignment, level control, and azimuth control. Light fixtures shall be oriented with the light beams parallel to the runway or taxiway centerline and facing in the required direction. The outermost edge of fixture shall be level with the surrounding pavement; the Contractor shall furnish and install can extensions and spacer rings as required. Surplus sealant or flexible embedding material shall be removed. The holding device shall remain in place until sealant has reached its initial set.

125-3.5 LED REILs. The Contractor shall install the salvaged LED REIL system on new concrete foundations at the location(s) shown on the Plans. The installation shall follow the Plan details and manufacturer's instructions. This work shall include all work between the master-slave units along with the units themselves, and all work inside the ground ring and furnishing/installing the washed stone surface treatment. The cable and conduit between the master and slave units and master/slave unit to junction structure shall be included under this item. Cable and conduit to the cabinet shall be paid for under other bid items.

125-3.6 Miscellaneous Lighting Equipment. The Contractor shall deliver the miscellaneous lighting equipment to the Airport as specified above.

METHOD OF MEASUREMENT

125-4.1 Airfield signs will be measured by the number of each type and size installed as completed units, in place, ready for operation, and accepted by the RPR.

125-4.2 Unlit Informational signs will be measured by the number of each type and size installed as completed units, in place, ready for operation, and accepted by the RPR.

125-4.3 Runway and taxiway lights on new cans will be measured by the number of each type installed as completed units in place, ready for operation, and accepted by the RPR.

125-4.4 Runway and taxiway lights on existing cans will be measured by the number of each type installed as completed units in place, ready for operation, and accepted by the RPR.

125-4.5 Runway End Identifier Lights shall be measured per set installed as a completed unit, in place, ready for operation, and accepted by the RPR.

125-4.6 Identification tags shall be measured by each unit, completed in place, including tag, etching, impediment, epoxy, and all appurtenances.

125-4.7 Change Sign Legend shall be paid at the Contract unit price for each sign, regardless of the number of panels, as a complete item installed and accepted by the RPR.

125-4.8 Miscellaneous Lighting Equipment will be measured per lump sum, delivered and accepted by the RPR.

BASIS OF PAYMENT

125-5.1 Airfield Signs will be paid at the Contract unit price for each item installed and accepted by the RPR. This price shall include full compensation for furnishing all materials, labor, equipment, excavation, preparation, assembly, associated sign base, concrete, cover, hardware, sign, lamps, transformer, bird spikes, wiring, grounding cable, ground rods, ID tag, testing, incidentals, and associated items as required for a complete and operating system.

125-5.2 Unlit Informational signs will be paid at the Contract unit price for each item installed and accepted by the RPR. This price shall include full compensation for furnishing all materials, labor, equipment, excavation, preparation, assembly, associated sign base, concrete, hardware, incidentals, and associated items as required for a complete and operating system.

125-5.3 Runway and taxiway lights on new cans will be paid at the Contract unit price for each item installed and accepted by the RPR. This price shall include full compensation for furnishing all materials, labor, equipment, excavation, preparation, assembly, associated light base, concrete, cover, hardware, fixture, lamps or light engine, transformer, wiring, grounding cable, ground rods, testing, incidentals, and associated items as required for a complete and operating system.

125-5.4 Runway and taxiway lights on existing cans will be paid at the Contract unit price for each item installed and accepted by the RPR. This price shall include full compensation for furnishing all cleaning, materials, labor, equipment, excavation, preparation, assembly, concrete, cover, hardware, fixture, lamps or light engine, transformer, wiring, grounding cable, ground rods, testing, incidentals, and associated items as required for a complete and operating system. No separate payment shall be made for light base can extensions or spacer rings.

125-5.5 Install Salvaged REILs on New Concrete Pad will be paid at the Contract unit price for each REIL set installed, complete, and accepted. This price shall be full compensation for furnishing all materials; for all preparation, assembly, and installation of these materials, including but not limited to the splice can, infrastructure between master and slave units, master/slave unit to junction structure, and foundation; and for all labor, equipment, tools, and incidentals necessary to complete these items. Conduit, conductor, trench, and backfill up to the runway circuit shall be paid under their separate respective bid items.

125-5.6 Identification tags will be paid at the Contract unit price for each item installed and accepted by the RPR. This price shall include full compensation for furnishing all materials, labor, equipment, preparation, assembly, incidentals, and associated items to complete this item as shown in the plans and to the satisfaction of the RPR.

125-5.7 Change Sign Legend shall be paid at the Contract unit price for each sign (front and back), regardless of the number of panels, as a complete item installed and accepted by the RPR. This price shall include full compensation for furnishing all cleaning, materials, labor, equipment, preparation, assembly, removal, hardware, testing, incidentals, and associated items as required for a complete and operating system.

125-5.8 Miscellaneous Lighting Equipment will be paid at the Contract unit price per lump sum, furnished and delivered by the Contractor. This price shall include full compensation to furnish all materials, labor, incidentals and associated items as are applicable to complete this item.

Payment will be made under:

L-125-5.1a	Construct New L-858B(L) Distance Remaining Sign and Concrete Pad – per each
L-125-5.1b	Construct New L-858(L) Airfield Guidance Sign (A1) and Concrete Pad – per each
L-125-5.1c	Construct New L-858(L) Airfield Guidance Sign (A2) and Concrete Pad – per each
L-125-5.1d	Construct New L-858(L) Airfield Guidance Sign (A3) and Concrete Pad – per each
L-125-5.1e	Construct New L-858(L) Airfield Guidance Sign (B1) and Concrete Pad – per each
L-125-5.1f	Construct New L-858(L) Airfield Guidance Sign (B2) and Concrete Pad – per each

L-125-5.1g	Construct New L-858(L) Airfield Guidance Sign (B3) and Concrete Pad – per each
L-125-5.1h	Construct New L-858(L) Airfield Guidance Sign (B4) and Concrete Pad – per each
L-125-5.1i	Construct New L-858(L) Airfield Guidance Sign (C1) and Concrete Pad – per each
L-125-5.1j	Construct New L-858(L) Airfield Guidance Sign (C2) and Concrete Pad – per each
L-125-5.1k	Construct New L-858(L) Airfield Guidance Sign (C3) and Concrete Pad – per each
L-125-5.1l	Construct New L-858(L) Airfield Guidance Sign (C4) and Concrete Pad – per each
L-125-5.1m	Construct New L-858(L) Airfield Guidance Sign (D1) and Concrete Pad – per each
L-125-5.1n	Construct New L-858(L) Airfield Guidance Sign (D2) and Concrete Pad – per each
L-125-5.1o	Construct New L-858(L) Airfield Guidance Sign (D3) and Concrete Pad – per each
L-125-5.1p	Construct New L-858(L) Airfield Guidance Sign (D4) and Concrete Pad – per each
L-125-5.1q	Construct New L-858(L) Airfield Guidance Sign (E1) and Concrete Pad – per each
L-125-5.1r	Construct New L-858(L) Airfield Guidance Sign (E2) and Concrete Pad – per each
L-125-5.1s	Construct New L-858(L) Airfield Guidance Sign (E3) and Concrete Pad – per each
L-125-5.1t	Construct New L-858(L) Airfield Guidance Sign (F1) and Concrete Pad – per each
L-125-5.1u	Construct New L-858(L) Airfield Guidance Sign (F2) and Concrete Pad – per each
L-125-5.1v	Construct New L-858(L) Airfield Guidance Sign (F3) and Concrete Pad – per each
L-125-5.1w	Construct New L-858(L) Airfield Guidance Sign (F4) and Concrete Pad – per each
L-125-5.1x	Construct New L-858(L) Airfield Guidance Sign (F5) and Concrete Pad – per each
L-125-5.1y	Construct New L-858(L) Airfield Guidance Sign (F6) and Concrete Pad – per each
L-125-5.1z	Construct New L-858(L) Airfield Guidance Sign (F7) and Concrete Pad – per each
L-125-5.1aa	Construct New L-858(L) Airfield Guidance Sign (F8) and Concrete Pad – per each
L-125-5.1bb	Construct New L-858(L) Airfield Guidance Sign (F9) and Concrete Pad – per each
L-125-5.2	Install Salvaged Unlit Informational Sign on Existing Concrete Pad – per each
L-125-5.3	Install Salvaged Unlit Informational Sign on New Concrete Pad – per each
L-125-5.4a	Install New L-861(L) Elevated Runway Edge Light and Adjust Existing Base Can – per each
L-125-5.4b	Install New L-861(L) Elevated Runway Edge Light on Existing Base Can – per each
L-125-5.5	Install New L-852D(L) In-Pavement Runway Edge Light and Adjust Existing Base Can – per each
L-125-5.6a	Install New L-861E(L) Runway Threshold Light and Transformer and Adjust Existing Base Can – per each
L-125-5.6b	Install New L-861E(L) Runway Threshold Light and Transformer on Existing Base Can – per each
L-125-5.7	Construct New L-861(L) Elevated Runway Edge Light and Base Can – per each
L-125-5.8	Construct New L-852D(L) In-Pavement Runway Edge Light and Base Can – per each
L-125-5.9	Construct New L-861T(L) Medium Intensity Elevated Taxiway Edge Light and Base Can – per each
L-125-5.10	Construct New L-852T(L) Medium Intensity In-Pavement Taxiway Edge Light and Base Can – per each

L-125-5.11 Install Salvaged Elevated Taxiway Edge Light and Transformer on Existing Base Can – per each

L-125-5.12 Install ID Tag – per each

L-125-5.13 Install Salvaged REILs on New Concrete Pad – per set

L-125-5.14 Change Sign Legend – per each

L-125-5.15a Miscellaneous Lighting Equipment for Runway – per lump sum

L-125-5.15b Miscellaneous Lighting Equipment for Taxiways – per lump sum

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5340-18	Standards for Airport Sign Systems
AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-28	Precision Approach Path Indicator (PAPI) Systems
AC 150/5345-39	Specification for L-853, Runway and Taxiway Retroreflective Markers
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5345-44	Specification for Runway and Taxiway Signs
AC 150/5345-46	Specification for Runway and Taxiway Light Fixtures
AC 150/5345-47	Specification for Series to Series Isolation Transformers for Airport Lighting Systems
AC 150/5345-51	Specification for Discharge-Type Flashing Light Equipment
AC 150/5345-53	Airport Lighting Equipment Certification Program
	Engineering Brief (EB)
EB No. 67	Light Sources Other than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures

END OF ITEM L-125

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State of California & Federal
Labor and Employment Law Overview

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Labor and Employment Law Overview: California[1]

Federal law and guidance on this subject should be reviewed together with this section (follows this section)

Summary

- California law prohibits an employer from discriminating and retaliating against employees in a variety of protected classes. Employers must also provide pregnancy accommodations, provide equal pay, allow wage discussions, allow employees to access their personnel files and protect whistleblowers. See EEO, Diversity and Employee Relations.
- California permits preemployment drug testing and background checks, but limits salary history inquiries. See Recruiting and Hiring.
- In California, there are requirements relating to the minimum wage, overtime, meal and rest breaks, breastfeeding breaks and child labor. See Wage and Hour.
- California has laws that relate to employee pay and benefits, including temporary disability insurance, health care continuation, pay statements, wage deductions and wage notice requirements. See Pay and Benefits.
- Under California law, employees are entitled to certain leaves or time off, including family and medical leave, paid family leave, paid sick leave, domestic violence leave and emergency responder leave. See Time Off and Leaves of Absence.
- California law requires employers to provide a safe working environment for their employees, including the development of a written Injury and Illness Prevention Program. California also prohibits smoking in the workplace and using a hand-held cell phone while driving. See Health and Safety.
- When employment ends, California employers must comply with applicable final pay, job reference and mass layoff notification requirements. See Organizational Exit.

Introduction to Employment Law in California

Many consider California the state with the most proscriptive variances from federal law, including broader antidiscrimination protections, a higher minimum wage, paid family leave insurance and paid sick leave.

Select California employment requirements are summarized below to help an employer understand the range of employment laws affecting the employer-employee relationship in the state. An employer must comply with both federal and state law.

An employer must also comply with applicable municipal law obligations affecting the employment relationship, in addition to complying with state and federal requirements.

EEO, Diversity and Employee Relations

Key California requirements impacting EEO, diversity and employee relations are:

Fair Employment Practices

The California Fair Employment and Housing Act (FEHA) prohibits employers with five or more employees from discriminating in the terms and conditions of employment. Protected characteristics include:

1 - Author: XpertHR Editorial Team
This resource is updated to reflect an increase in the state minimum wage; and amendments regarding time off and leave of absence for the jurisdiction of the state of California, effective January 1, 2021.
https://www.xperthr.com/employment-law-manual/labor-and-employment-law-overview-california/215/

- Race;
- Religion;
- Color;
- National origin and ancestry;
- Physical or mental disability;
- Medical condition;
- Genetic information;
- Marital status;
- Sex (including breastfeeding and related conditions);
- Sexual orientation;
- Gender identity/gender expression;
- Pregnancy (including childbirth and related medical conditions);
- Age; and
- Military or veteran status.

Harassment is a form of illegal discrimination that is prohibited under the FEHA.

The FEHA also prohibits retaliation against a person who opposes, reports or assists another person in opposing unlawful discrimination.

Pregnancy Accommodation

The FEHA requires an employer to provide reasonable accommodations to an employee because of pregnancy, childbirth or a related medical condition. Examples of reasonable accommodations include modified duties, schedules or equipment.

Religious Accommodation

The FEHA explicitly provides for religious accommodation in employment. The FEHA requires an employer to show significant difficulty or expense to prove undue hardship, versus the de minimus standard under federal law.

Disability Accommodation

An employer is obligated to provide reasonable accommodations to qualified individuals with disabilities. The FEHA makes it a separate violation for an employer to fail to engage in the interactive process.

Equal Pay

California prohibits discrimination on the basis of sex, race and ethnicity in the payment of wages for substantially similar work. As a defense against a wage discrimination claim, an employer must show that the pay differential is based on a bona fide factor other than sex, such as seniority, merit, quality or quantity of production, education, training or experience. Prior salary, on its own, does not justify a wage differential.

Discussion of Wages

An employer may not prohibit employees from disclosing, discussing or inquiring about their own wages or the wages of another employee and may not discriminate or retaliate against employees for engaging in such conduct.

Access to Personnel Files

California employers must provide current and former employees with access to their personnel files. The employer must make the records available for inspection by the requester at reasonable times and intervals, but generally no later than 30 calendar days after receiving a written request. The employer may charge a fee that equals the actual cost of copying the materials.

Whistleblower Protections

A California employer may not make, adopt or enforce any rule, regulation or policy preventing an employee from being a whistleblower. Also, an employer may not retaliate because an employee:

- Is a whistleblower;
- Refuses to participate in an activity that would result in a violation of a state or federal statute or a violation of or noncompliance with a state or federal rule or regulation; or
- Exercises his or her rights as a whistleblower in any former employment.

A whistleblower is an employee who discloses information to a government or law enforcement agency where the employee has reasonable cause to believe that the information discloses:

- A violation of a state or federal statute;
- A violation of or noncompliance with a state or federal rule or regulation; or
- Unsafe working conditions or work practices in the employee's employment or place of employment.

Be aware that where there is overlap between federal, state and/or local law, complying with the law that offers the greatest rights or benefits to the employee will generally apply.

Additional information on EEO, diversity and employee relations practices in California can be found in the California Employee Handbook Table of Contents, Disabilities (ADA): California, EEO - Discrimination: California, EEO - Harassment: California, EEO - Retaliation: California, HR Management: California, Employee Discipline: California, California Workplace Labor and Employment Law Posters and Does This Law Apply to My Organization in California? Federal requirements can be found in Disabilities (ADA): Federal, EEO - Discrimination: Federal, EEO - Harassment: Federal, EEO - Retaliation: Federal, HR Management: Federal and Employee Discipline: Federal.

Recruiting and Hiring

Key California requirements impacting recruiting and hiring are:

Drug Testing

Drug testing of job applicants is allowed in California. An employer must provide applicants with notice of the drug testing requirement.

Credit Checks

Under the Consumer Credit Reporting Agencies Act, an employer may perform credit checks only for certain positions (e.g., a law enforcement position), and it must provide applicants for such positions with notice that a credit check will be performed. Further, the employer must notify applicants of any adverse action taken on the basis of the credit check.

Criminal Checks

An employer must show that any criminal history information sought is job-related and consistent with business necessity. The employer may not consider certain types of criminal history when making hiring decisions, including:

- An arrest that did not result in conviction;
- Participation in a pre-trial or post-trial diversion program;
- Convictions that have been ordered sealed, expunged or eliminated by statute;
- An arrest, detention or court disposition that occurred while a person was subject to a juvenile court; and
- A nonfelony conviction for marijuana possession that is more than two years old.

Consumer Reports

An employer may seek investigative consumer reports for employment purposes. The Investigative Consumer Reporting Agencies Act requires the employer to provide written notice to applicants before the report is procured.

Ban the Box

The California Fair Employment and Housing Act prohibits an employer with five or more employees from including any question on a job application that asks about the applicant's criminal conviction history. This statewide "ban the box" law also prohibits covered employers from inquiring about or considering an applicant's criminal history until the applicant has received a conditional offer.

Salary History Inquiry Restrictions

California prohibits an employer from relying on a job applicant's salary history as a factor in determining whether to offer employment or what salary to offer. The law bans employers from asking applicants about their salary history, including compensation and benefits, orally or in writing.

An employer may consider or rely on salary history information that an applicant discloses voluntarily and without prompting, but may not rely on prior salary, by itself, to justify any disparity in compensation. In addition, an employer must provide a position's pay scale to an applicant who makes a reasonable request for that information.

Be aware that where there is overlap between federal, state and/or local law, complying with the law that offers the greatest rights or benefits to the employee will generally apply.

Additional information on recruiting and hiring practices in California can be found in the California Employee Handbook Table of Contents, Preemployment Screening and Testing: California, Interviewing and Selecting Job Candidates: California and Does This Law Apply to My Organization in California? Federal requirements can be found in Preemployment Screening and Testing: Federal and Interviewing and Selecting Job Candidates: Federal.

Wage and Hour

Key California requirements impacting wages and hours are:

Minimum Wage

The minimum wage in California varies depending on the size of the employer. Currently, an employer with 25 or fewer employees must pay employees $13.00 per hour and an employer with 26 or more employees must pay employees $14.00 per hour.

Overtime

California law requires an employer to pay employees overtime for all hours worked in excess of 40 hours in a workweek and eight hours in a workday. An employer is also required to pay overtime to employees who work a seventh consecutive day in a workweek.
A California employer must pay overtime to nonexempt employees at the rate of one and one-half times the employee's regular rate of pay for all hours worked in excess of 40 in any workweek; for all hours worked in excess of eight, up to and including 12 hours, in any workday; and for the first eight hours of work on the seventh consecutive day of work in a workweek. An employer is further required to pay double the employee's regular rate of pay for all hours worked in excess of 12 in any workday and for all hours worked in excess of eight on the seventh consecutive day of work in a workweek.

Rest Breaks

A California employer must provide nonexempt employees with a paid 10-minute rest period for each four-hour work period. Rest periods must be given as close to the middle of the work period as is practicable. An employee is entitled to one hour of pay for each workday that the rest period is not authorized or permitted.

Meal Breaks

An employer in California must provide nonexempt employees with no less than a 30-minute meal period if they work more than five hours a day. A second meal period of no less than 30 minutes must be provided when the employee's work period is more than 10 hours. An employee is entitled to one hour of pay for each shift that the meal period is not provided.

Breastfeeding Breaks

A California employer must provide a reasonable amount of break time to accommodate an employee desiring to express breast milk for the employee's infant child each time the employee has need to express milk. When possible, the break time should run concurrently with any break time already provided to the employee. Break time that does not run concurrently with the existing break time does not have to be paid. An employer is not required to provide break time if doing so would seriously disrupt the employer's operations.

An employer must provide an employee with the use of a room or other location for the employee to express milk in private. The room or location may include the place where the employee normally works if it otherwise meets certain legal requirements. Under certain circumstances, an employer may claim undue hardship.

An employer must develop and implement a lactation accommodation policy and include it in the employee handbook or policies provided to employees. The employer must distribute the policy to new employees upon hire and when an employee makes an inquiry about or requests parental leave.

Child Labor

Child labor laws in California restrict the occupations in which minors may be employed and the number of hours and times during which they may work.

For most occupations, California had adopted the federal standards into its own regulations. However, California's regulations also forbid minors under the age of 16 from working in additional occupations, involving, among others, several types of machines, railroads, dangerous acids, scaffolding and tobacco.

California also has a complex set of requirements that govern the times during which minors may work. These requirements differ depending on the age of the minor, with separate working time restrictions set out for 16- and 17-year-olds, for 14- and 15-year-olds and for 12- and 13-year-olds.

California requires almost all minors to have a permit to work.

California also has many additional regulations that are specific to the entertainment industry.

Be aware that where there is overlap between federal, state and/or local law, complying with the law that offers the greatest rights or benefits to the employee will generally apply.

Additional information on wage and hour practices in California can be found in the California Employee Handbook Table of Contents, Minimum Wage: California, Overtime: California, Hours Worked: California, Child Labor: California, California Workplace Labor and Employment Law Posters and Does This Law Apply to My Organization in California? Federal requirements can be found in Minimum Wage: Federal, Overtime: Federal, Hours Worked: Federal and Child Labor: Federal.

Pay and Benefits

Key California requirements impacting pay and benefits are:

Temporary Disability Insurance

California's State Disability Insurance (SDI) program is a state-run plan administered by the Employment Development Department (EDD). SDI provides partial wage replacement to eligible workers who are unable to perform their regular or customary work due to a nonwork-related illness or injury, including pregnancy-related conditions. The program is funded entirely by taxes withheld from employees' wages.

An employer has the option of establishing a voluntary private plan, subject to EDD approval, in lieu of the state-administered plan.

Health Care Continuation

The California Continuation Benefits Replacement Act (Cal-COBRA) requires group health plans issued to employers with two to 19 employees to offer continuation coverage to qualified beneficiaries (employees and eligible dependents). Cal-COBRA mirrors the federal Consolidated Omnibus Budget Reconciliation Act (COBRA) in terms of qualifying events and timelines. Cal-COBRA's notice requirements and premiums differ from COBRA.

Cal-COBRA also requires group health plans to offer an insured who has exhausted continuation coverage under federal COBRA the opportunity to continue coverage for up to 36 months from the date the insured's continuation coverage began, if the insured is entitled to fewer than 36 months of COBRA coverage.

Payment of Wages

California requires that employees be paid either in cash or by checks that can be cashed in full, without fees or discounts, at an established place of business located within the state.

Direct deposit is permitted if:

- The employee chooses the financial institution;
- The financial institution has a branch in California; and
- The employee voluntarily authorizes the deposit.

Pay Statements

California employers must provide each employee with an accurate, itemized written pay statement in the form of a detachable part of a check or a separate written statement. Statements must be provided each time wages are paid, or at least semimonthly, and must contain the following information:

- Gross wages earned;
- Total hours worked (for nonexempt employees);
- Number of piece-rate units earned and the applicable piece rate (for piece-rate basis employees);
- All deductions;
- Net wages earned;
- Inclusive dates of the pay period;
- Employee's name and last four digits of employee's Social Security Number or employee ID number;
- Employer's name and address;
- All applicable hourly rates in effect during the pay period and the corresponding number of hours worked at each rate by the employee; and
- If paying overtime from a previous pay period, the previous overtime shown as a correction, and the inclusive dates for the pay period the overtime was worked.

Additional requirements exist for piece-rate employees and temporary services employees.

Pay Frequency

Employers must designate paydays in advance.

Nonexempt employees must be paid all wages earned at least twice a month (i.e., semimonthly) on regular paydays designated in advance. Overtime must be paid by the following payday for the next regular payroll period following the payroll period in which the overtime wages were earned.

Exempt employees may be paid once a month on or before the 26th of each month in which the salary is earned, including the amount yet to be earned from the 26th through the end of the month.

Wage Deductions

An employer may make deductions from an employee's wages if required by state or federal law or court order, with the employee's written authorization or for other permissible reasons, including but not limited to child support withholding, creditor garnishments and tax levies.

Wage Notices

The Wage Theft Prevention Act requires an employer to provide notice of certain pay-related information (e.g., the employee's rate of pay and the basis for such rate, the employer's regular pay period, the employer's name) to nonexempt employees at the time of hire and any time the information changes.

Be aware that where there is overlap between federal, state and/or local law, complying with the law that offers the greatest rights or benefits to the employee will generally apply.

Additional information on pay and benefits practices in California can be found in the California Employee Handbook Table of Contents, Insurance and Disability Benefits: California, Health Care Continuation (COBRA): California, Payment of Wages: California, Involuntary and Voluntary Pay Deductions: California, California Workplace Labor and Employment Law Posters and Does This Law Apply to My Organization in California? Federal requirements can be found in Insurance and Disability Benefits: Federal, Health Care Continuation (COBRA): Federal, Payment of Wages: Federal and Involuntary and Voluntary Pay Deductions: Federal.

Time Off and Leaves of Absence

Key California requirements impacting time off and leaves of absence are:

Family and Medical Leave

The California Family Rights Act (CFRA) requires employers with five or more employees to provide eligible employees with up to 12 weeks of job-protected leave in a 12-month period for the employee's or a covered family member's serious health condition, for the birth or placement for adoption or foster care of a child, or for a qualifying exigency related to the covered active duty or call to covered active duty of an employee's spouse, domestic partner, child or parent in the US Armed Forces. While the CFRA and the federal Family and Medical Leave Act (FMLA) parallel each other to a large degree, there are areas in which they differ, such as covered family members and what is considered a serious health condition.

Paid Family Leave

California provides for paid family leave (PFL) benefits under a Family Temporary Disability Insurance program. Eligible employees receive partial wage replacement when taking time off to care for a seriously ill family member (i.e., child, parent, spouse, registered domestic partner, grandparent, grandchild, sibling or parent-in-law), to bond with a child within one year of birth or placement for adoption or foster care, or to participate in a qualifying exigency related to the covered active duty or call to covered active duty of the employee's spouse, domestic partner, or parent who is the US Armed Forces. Employees may take up to eight weeks of PFL in a 12-month period.

Paid Sick Leave

Under the Healthy Workplaces, Healthy Families Act (HWHFA), eligible employees may take paid sick leave for the following reasons:

- Diagnosis, care or treatment of the employee's or a covered family member's existing health condition;
- Preventive care for the employee or a covered family member; and
- For an employee who is a victim of domestic violence, sexual assault or stalking to obtain legal, medical or social services.

Employees may accrue and use up to 24 hours (or three days) of paid sick leave per year. Total accrual, including carryover of unused accrued time, may not exceed 48 hours (or six days) per year.

Other Time Off Requirements Affecting California Employers

In addition to the CFRA and HWHFA, a California employer is also required to comply with more than a dozen other leave and time off laws, such as:
Pregnancy disability leave (covering employers with five or more employees);

- Kin care leave;
- Family military leave (covering employers with 25 or more employees);
- Bone marrow and organ donor leave (covering employers with 15 or more employees);
- School activities leave (covering employers with 25 or more employees);
- School discipline leave;
- Domestic violence and crime victim leave;
- Leave to attend judicial proceedings;
- Jury duty leave;
- Voting leave;
- Election official leave;
- Military leave;
- Civil Air Patrol leave (covering employers with 15 or more employees);
- Literacy leave (covering employers with 25 or more employees);
- Drug and alcohol rehabilitation leave (covering employers with 25 or more employees);
- Day of rest requirements.

Be aware that where there is overlap between federal, state and/or local law, complying with the law that offers the greatest rights or benefits to the employee will generally apply.

Additional information on time off and leave of absence practices in California can be found in the California Employee Handbook Table of Contents, FMLA: California, Paid Sick Leave: California, Jury Duty: California, Other Leaves: California, USERRA: California, Hours Worked: California, California Workplace Labor and Employment Law Posters and Does This Law Apply to My Organization in California? Federal requirements can be found in FMLA: Federal, Paid Sick Leave: Federal, Jury Duty: Federal, Other Leaves: Federal, USERRA: Federal and Hours Worked: Federal.

Health and Safety

Key California requirements impacting health and safety are:

Occupational Safety and Health

California operates its job safety and health programs covering the private sector under a state plan approved by the federal Occupational Safety and Health Administration (OSHA).

Under the California Occupational Safety and Health Act (Cal/OSH Act), a California employer must provide and maintain a safe and healthful workplace for employees and, to that end, is required to develop and maintain a written, effective Injury and Illness Prevention Program that includes, among other things, instruction on safe workplace practices.

Smoke-Free Workplace

California bans smoking, including the use of e-cigarettes, in enclosed spaces of places of employment. An employer needs to take reasonable steps to prevent smoking in the workplace, such as posting "no smoking" signs.

Safe Driving Practices

Drivers in California are prohibited from holding and operating a hand-held cell phone or electronic wireless communications device, but are permitted to use the voice-operated and hands-free functions on the phone or device. However, a driver may use a single swipe or tap of the finger to operate a hand-held phone or device that is mounted on the windshield, dashboard or center console.

Be aware that where there is overlap between federal, state and/or local law, complying with the law that offers the greatest rights or benefits to the employee will generally apply.

Additional information on health and safety practices in California can be found in the California Employee Handbook Table of Contents, HR and Workplace Safety: California, Employee Health: California, California Workplace Labor and Employment Law Posters and Does This Law Apply to My Organization in California? Federal requirements can be found in HR and Workplace Safety (OSHA Compliance): Federal and Employee Health: Federal.

Organizational Exit

Key California requirements impacting organizational exit are:

Final Pay

An employer must pay final wages immediately to an employee who is terminated and upon resignation to an employee who provides at least 72 hours' notice of the intent to resign. If an employee provides fewer than 72 hours' notice of the intent to resign, then an employer may generally mail final wages within 72 hours.

California law does not permit "use it or lose it" vacation policies. Vacation accruals may be capped, but may not be forfeited. Therefore, unused, accrued vacation must be paid out at the end of employment.

Wages owed to a deceased employee must be paid to the surviving spouse or conservator of the estate. Probate of the will need not have occurred before payment is made. The employer must pay up to $15,000 net for wages due for personal services and unused vacation time. The party requesting payment must present to the employer reasonable proof of identity and an affidavit or a declaration under penalty of perjury making certain statements of fact.

References

California law affords a qualified privilege to an employer who communicates about a former employee's job performance or qualifications to a prospective employer. The communication must be made in good faith.

Mass Layoff Notifications

The California Worker Adjustment and Retraining Notification Act (Cal-WARN Act) provides employees and their families time to prepare for a prospective job loss by requiring an employer to provide advance notice of a plant closing or mass layoff. While the state law is modeled after the federal Worker Adjustment and Retraining Notification Act (WARN Act), there are areas in which they differ, such as the definition of covered employer.

Be aware that where there is overlap between federal, state and/or local law, complying with the law that offers the greatest rights or benefits to the employee will generally apply.

Additional information on organizational exit practices in California can be found in the California Employee Handbook Table of Contents, Payment of Wages: California, Performance Appraisals: California, Involuntary

Terminations: California and Does This Law Apply to My Organization in California? Federal requirements can be found in Payment of Wages: Federal, Performance Appraisals: Federal and Involuntary Terminations: Federal.

Labor and Employment Law Overview: Federal[2]

State law and guidance on this subject should be reviewed together with this section

Summary

- Federal law prohibits an employer from discriminating and retaliating against employees who fall into a variety of protected classes. These restrictions apply to nearly every aspect of employment. It also requires employers to provide disability and religious accommodations, as well as provide men and women equal pay for equal work. In addition, federal law protects the rights of employees to form unions. See EEO, Diversity and Employee Relations.

- Employers are restricted by federal law in the use of credit checks and drug testing in hiring, and are required to verify employees' eligibility and authorization to work in the United States. See Recruiting and Hiring.

- The federal Fair Labor Standards Act imposes employer requirements regarding the payment of a minimum wage and overtime; the provision of breaks for meals, rest and breastfeeding; and child labor. See Wage and Hour.

- Employers must comply with federal, state and local laws when paying employees and reporting and remitting amounts withheld from employees' wages to taxing agencies. In addition, employers that provide certain health care benefit and retirement plans must comply with minimum federal standards for most retirement and health plans set up by private employers to protect the interests of participating employees. See Pay and Benefits.

- Federal law requires an employer to provide employees with certain leaves, including family and medical leave and military leave. See Attendance and Leaves.

- Employers are required by federal law to provide a safe working environment for their employees. For certain employers, this includes maintaining a drug-free workplace. See Health and Safety.

- Certain employers are required to provide notice to employees in the event of a plant closing or mass layoff. See Organizational Exit.

Introduction to Federal Employment Law

Employment law governs the duties, rights and obligations within the employer-employee relationship. While some laws are designed to protect employees, others make it possible for employers to effectively manage their workforce. Federal employment law is composed of a complex set of rules made up of various components, such as:

- Executive Orders;
- Statutes;
- Regulations;
- Agency interpretive materials and opinions; and
- Case law.

2 - Author: XpertHR Editorial Team
This resource is kept under review and updated in line with developments and is enhanced to improve the comprehensiveness, organization and topics covered of federal employment laws.
https://www.xperthr.com/employment-law-manual/labor-and-employment-law-overview-federal/210/

However, not all federal laws necessarily apply to every employer. A law's applicability depends on a variety of factors including the employer's size, the location of its business and employees and the industry in which the employer operates.

In addition, an employer must also comply with state and local laws. If the applicable federal, state and local laws conflict, an employer should comply with the law that provides the greatest benefit to the employee.

Employee and Employer Rights and Responsibilities

Various employment laws provide employees with certain rights, such as the right to:

- Be paid fair wages;
- A safe workplace;
- A workplace free from discrimination and harassment; and
- File complaints against an employer without fear of retaliation.

Along with these rights come certain responsibilities. For example, employees should:

- Perform their work in the employer's best interests;
- Perform their work to the employer's high standards; and
- Not disclose the employer's trade secrets.

Employers, on the other hand, must follow the letter and spirit of the law throughout the employment life cycle. An employer's responsibility in this regard applies not only to current employees but also to prospective and former employees.

Select federal employment requirements are summarized below to help an employer understand the range of employment laws affecting the employer-employee relationship.

EEO, Diversity and Employee Relations

Fair Employment Practices

Fair employment practice laws are designed to ensure equal employment opportunity. Such laws protect employees from discrimination and require employers to treat employees equally.

Title VII of the Civil Rights Act of 1964 (Title VII) prohibits employment discrimination based on race, color, national origin, sex and religion. The law applies to:

- Private and public employers with 15 or more employees;
- The federal government;
- Employment agencies; and
- Labor organizations.

Enforced by the Equal Employment Opportunity Commission (EEOC), Title VII prohibits discrimination in almost every aspect of employment including:

- Recruitment;
- Hiring;
- Pay and benefits;
- Assignments;
- Promotions;
- Discipline; and
- Discharge.

The EEOC published the Uniform Guidelines on Employee Selection Procedures to help employers, including federal contractors, comply with federal laws prohibiting discrimination based on race, color, national origin, sex and religion. The guidelines apply to all aspects of the selection process including recruiting, interviewing, testing and performance evaluations, to the extent they are used as a basis for

employment decisions. The guidelines provide employers with guidance to help determine if their selection procedures have a disparate (or adverse) impact on a protected class.

Title VII also prohibits:

- Harassment against an individual based on or motivated by an individual's membership in a legally protected class;
- Retaliation against an employee for engaging in activity protected under the law, such as complaining about discrimination or harassment, filing a complaint with the EEOC or participating in a discrimination investigation or lawsuit; and
- Discrimination on the basis of pregnancy, childbirth or related conditions (including failure to treat pregnant employees equally, not preferentially).

While Title VII does not explicitly include sexual orientation or gender identity in its list of protected classes, the US Supreme Court has ruled that the statute's sex discrimination provision prohibits discrimination against employees on the basis of sexual orientation or gender identity.

Executive Order 11246 prohibits federal contractors and certain federally assisted construction contractors and subcontractors from discriminating in employment decisions on the basis of protected characteristics. It also requires government contractors to take affirmative action to ensure that equal opportunity is provided in all aspects of employment.

The Age Discrimination in Employment Act (ADEA) prohibits employers from treating an applicant or employee less favorably because of their age. It applies to:

- Private employers with 20 or more employees;
- Federal, state and local governments and employment agencies, no matter how many employees; and
- Labor unions that operate a hiring hall or have at least 25 members.

The ADEA prohibits employers from discriminating against or harassing an employee who is age 40 or older with respect to all aspects of employment such as hiring, firing, promotions, pay and benefits and training. The ADEA does not protect individuals aged under 40, and does not prohibit an employer from providing more favorable treatment to older individual's within the same protected class (e.g., an employer may provide more generous benefits to employees aged 50 or above than it does to employees aged 40 or over).

The Older Workers Benefit Protection Act (OWBPA) amended the ADEA to prohibit age discrimination in the provision of employment benefits. The OWBPA also imposes certain restrictions on employers seeking releases relating to age discrimination claims.

In addition, the Genetic Information Nondiscrimination Act (GINA) prohibits employers from:

- Harassing or discriminating or retaliating against employees and applicants based on genetic information;
- The use of genetic information in making employment decisions, such as hiring or firing an employee or classifying workers in a way that would deprive them of employment opportunities; or
- Requesting, requiring or purchasing genetic information except under specific circumstances and includes strict limitations on their ability to disclose genetic information.

Disability Accommodation

The Americans with Disabilities Act (ADA) and its amendments prohibit discrimination against an individual with a disability with respect to:

- Job application procedures;
- Hiring and advancement;
- Termination;
- Compensation;
- Job training; and
- Other terms, conditions and privileges of employment.

The law also requires an employer to provide a reasonable accommodation to an individual with a disability who is qualified for the job the individual holds or desires.

Under the ADA an individual with a disability is one who has a physical or mental impairment that substantially limits one or more of the individual's major life activities. This includes individuals who have a record of such impairment and individuals who are regarding as having such an impairment.

When an employer becomes aware that an employee has a disability under the ADA, it is required to engage in an interactive discussion with the employee to determine if a reasonable accommodation can be made that enables the employee to perform the essential functions of the job.

The ADA applies to employers of 15 or more individuals during a 20-week period.

Equal Pay

All employers are required to comply with the Equal Pay Act (EPA). The EPA:

- Prohibits discrimination in the payment of wages on the basis of sex;
- Requires that men and women receive equal pay for equal work in the same establishment; and
- If there is an inequality in wages between men and women, prohibits reducing the wages of either sex to equalize their pay.

Equal work is defined as work that requires equal skill, effort and responsibility, and that is performed under similar working conditions. In other words, the jobs do not need to be identical, but they must be substantially equal.

The EPA defines pay broadly to include salary, overtime, bonuses, vacation and holiday pay, stock options, life insurance and all other benefits and compensation.

The Lilly Ledbetter Fair Pay Act amended the EPA's 180-day statute of limitations for filing a discriminatory pay charge to allow the limitations period to reset with each new discriminatory action. Accordingly, every time an employee receives a discriminatory payment, the employee has a new period of 180 days in which to file a claim.

Religious Accommodation

Title VII requires employers to provide reasonable accommodations for an employee's sincerely held religious practices or beliefs, unless doing so would create an undue hardship (i.e., more than a de minimis cost or burden on the employer). A sincerely held religious belief is a religious principle that is truly believed by the individual and includes moral and ethical beliefs that assume the function of a religion in the person's life.

Reasonable accommodations may include permitting employees to participate in religious activities (such as prayers) at the workplace, allowing attire that does not conform to a workplace dress code or allowing reasonable scheduling changes or time off to attend religious events.

An accommodation may be considered to create an undue hardship if it:

- Requires more than basic administrative costs;
- Decreases job efficiency or productivity;
- Infringes on other employees' job rights or benefits;
- Threatens workplace safety;
- Imposes on co-workers to share burdensome work; or
- Conflicts with another law or regulation.

Labor Relations

The National Labor Relations Act (NLRA) is the principle federal law governing labor relations; the National Labor Relations Board (NLRB) enforces it. All employers, whether unionized or not, are subject to the NLRA, except for government employers and railroads or airlines that are subject to the Railway Labor Act.

The NLRA grants employees the right to engage in concerted activity for mutual aid and protection, as well as the right to refrain from such activities. This includes activities such as:

- Forming, joining or assisting a union;
- Bargaining collectively through representatives chosen by employees;
- Discussing wages, benefits and other terms and conditions of employment;
- Seeking union assistance with work related complaints; and
- Striking and picketing, depending on the purpose or means.

In addition, the NLRA prohibits unfair labor practices (ULPs) by employers, including interfering with, restraining or coercing employees who exercise their rights under the NLRA. Unions also are prohibited from certain ULPs, including threatening or coercing employees to support the union, taking adverse action against an employee who has not joined or does not support the union or causing an employer to discriminate against an employee for union-related activity.

Whistleblower Protections

Numerous federal statutes include provisions that prohibit employers from taking adverse or negative employment actions against whistleblowers, including the:
Fair Labor Standards Act (FLSA);
Family and Medical Leave Act (FMLA);
Affordable Care Act (ACA); and
Occupational Safety and Health Act (OSH Act).

Whistleblowing occurs when an employee reports information or makes a complaint of employer mismanagement, corruption, violation of law or other wrongdoing or misconduct.

Policies and practices should be implemented to provide adequate means for employees to make whistleblowing complaints internally and protect whistleblowers from retaliation.

If an employee engages in protected whistleblowing activity, an employer has an obligation to ensure that the employee is not subject to threats, harassment or other forms of discrimination or retaliation because of the protected activity. Any disciplinary action, demotion, suspension or discharge should be reviewed to make sure the decision is based on conduct unrelated to the employee's protected activity.

Recruiting and Hiring

Credit Checks

The Fair Credit Reporting Act (FCRA) governs how credit information is accessed and may be used in making employment decisions making employment decisions. Although the FCRA provides the national standards for employment screening performed by a consumer reporting agency, it does not apply when an employer conducts its own background checks.

An employer must make a clear and conspicuous written disclosure to an applicant or employee and obtain their prior written authorization before acquiring a consumer report. In addition, an employer must certify to the consumer reporting agency that the report will not be used in violation of any federal or state equal opportunity laws.

Before taking any adverse action based on a consumer credit report obtained from a consumer reporting agency, an employer is required to provide an applicant or employee with:
A summary of FCRA rights;

- The name, address and telephone number of the consumer reporting agency making the report;
- A copy of the credit report; and
- Information on how to dispute the contents of the report.

Drug Testing

Generally, an employer may require applicants to undergo pre-employment drug testing, so long as the testing is nondiscriminatory and the accuracy of the drug-testing program can be confirmed. An employer may test current employees for drug use, provided the employer demonstrates a legitimate need for requiring the test.

Before extending a job offer, an employer may ask questions concerning whether the applicant is currently using, or has previously used, alcohol or drugs illegally. But the employer cannot ask how frequently or in what quantities the applicant used drugs or alcohol or any question likely to elicit information about a past addiction.

Criminal Background Checks

While federal law does not prohibit pre-employment inquiries about arrest and conviction records, the EEOC takes the position that disqualifying applicants strictly on the basis of criminal records may have a disparate impact on certain racial and ethnic groups.

The EEOC recommends that employers make an individualized assessment of job requirements and applicants, including, if possible, an interview with the applicant, before rejecting them based on their criminal history. An employer should not reject an applicant based on a criminal conviction unless the conviction is relevant to the job or there is another legitimate business reason.

Consider the following factors before making any decision based on criminal history:

- The nature of the job sought;
- The nature and seriousness of the offense; and
- The amount of time that has passed between the offense and the job application.

Employment Eligibility and Work Authorization

The Immigration Reform and Control Act (IRCA) makes it unlawful to knowingly hire, recruit or continue to employ an individual not authorized to work in the United States. IRCA requires all employers to verify an employee's identity and employment eligibility. In order to do so, employers and employees are required to complete Form I-9, Employment Eligibility Verification, to verify an employee's identity and employment eligibility. An employer is subject to federal civil and criminal sanctions for IRCA violations.

An employer may use E-Verify to confirm an employees' work eligibility. E-Verify compares the information provided on Form I-9 against data in various federal government databases, and advises employers whether the information submitted matches government records and whether the new hire is authorized to work in the US. Participation in E-Verify is free of charge and voluntary for most employers in most states. However, employers are required to use it in some states and under some federal contracts.

An employer that uses E-Verify must comply with notice posting requirements.

Wage and Hour

Minimum Wage

The federal Fair Labor Standards Act (FLSA) requires covered employers to pay nonexempt employees the federal hourly federal minimum wage rate for every hour they work. In addition to federal minimum wage requirements, an employer must comply with state and local minimum wage requirements, which may differ from the federal minimum wage. When these rates conflict, an employer must pay covered employees the rate that is most beneficial to the employee.

Complying with minimum wage requirements goes beyond paying employees the correct hourly rate. For example:

- Deductions that reduce an employee's net pay below the minimum wage are generally prohibited, with some exceptions.

- Certain employees, such as students, workers with disabilities, apprentices and messengers, may be paid a subminimum wage.
- Employers may pay workers aged under 20 a rate that is lower than the minimum wage for the first 90 days of their employment.

Overtime

Most private employers must pay nonexempt employees overtime pay when they work more than a certain number of hours, usually 40 in a workweek, which is defined as a fixed and regularly recurring period of 168 hours, or seven consecutive 24-hour periods. The workweek does not have to coincide with the calendar week.

Overtime hours are paid at one and one-half times an employee's regular rate of pay. Most often, calculating the amount of an employee's overtime pay is as simple as multiplying the employee's regular rate of pay by one and one-half for each hour of overtime. However, there are many situations that are more complicated.

Rest Breaks

Although an employer is not required to provide rest breaks to employees under the FLSA, if an employer does provide rest breaks it must comply with the FLSA regarding compensability of such time. In general, short rest breaks of 20 minutes or less are counted as hours worked and are usually paid. Breaks lasting longer than 20 minutes do not count as hours worked and are usually not compensated.

Meal Breaks

The FLSA also does not require an employer to provide meal breaks. But if an employer chooses to provide them, the employees must be completely relieved from duty for the purpose of eating regular meals. Employers that do provide meal breaks usually allow at least 30 minutes. The time employees are on the break does not constitute working time. An employee is not completely relieved from duty if they are required to perform any work, whether active or inactive, while eating.

Breastfeeding Breaks

The FLSA requires employers to provide nonexempt female employees with reasonable break time to express breast milk for a nursing child for one year after the child's birth. The frequency of the breastfeeding breaks may vary. However, the US Department of Labor's basic benchmark is two or three 15 to 20 minute breaks per eight-hour shift. Additional time should be permitted for the employee to walk to and from the dedicated lactation space, retrieve a pump and other supplies, store the expressed milk in the refrigerator or take other actions necessary to express milk.

An employer is also required to provide a place to express breast milk, other than a bathroom, that is shielded from the view or intrusion of coworkers and the public.

While an employer is not required to pay nursing employees for time spent in breastfeeding breaks, if an employer provides other types of paid rest breaks (e.g., smoking or coffee breaks), it must compensate employees who use that break time to express milk.

An employer with fewer than 50 employees is not subject to FLSA breastfeeding break requirements if compliance would impose an undue hardship.

Many states and localities have enacted similar laws, which may provide greater employee protections and rights than federal law.

Child Labor

The FLSA's child labor provisions govern the number of hours and the type of work performed by minors. Restrictions may vary depending on the age of the minor. For example, different rules apply to minors under age 18, 16 and 14 regarding the number of hours and the times of day and/or year they may work and the types of work they may be perform.

Although not required, an employer may obtain an age certificate showing that an employee meets the age requirements established by the FLSA to help shield itself from liability.

Pay and Benefits

Payment of Wages

Employers must comply with federal, state and local laws when paying employees. The federal FLSA only generally requires that employees be paid by their regular payday and prohibits employers from changing pay frequencies to avoid paying overtime pay. The vast majority of the wage payment laws and regulations that employers must comply with are at the state level and they are more specific than the FLSA.

Wage Withholding

Employers are required to make deductions from employees' wages for federal, state and local income taxes and employment taxes (i.e., Social Security and Medicare taxes and unemployment taxes). In addition, employers must withhold these taxes on the value of the fringe benefits and health insurance benefits they provide to employees. In addition, an employer may be required to withhold and remit payments for child support, creditor garnishments, student loans, tax liens or other employee debts.

Payroll Tax Reports and Deposits

As part of their payroll obligations, employers that withhold federal income and employment taxes from employees' pay are required to timely file reports reflecting the total amount of taxable wages paid to employees and the income and employment taxes withheld from those wages. These reports must be on required forms and filed with the Internal Revenue Service, the Social Security Administration and state and local tax agencies. Employers are also required to make deposits of the amounts withheld according to certain schedules, depending on the amount of deposits and other factors. All these amounts must be periodically reconciled.

In addition, all employers must report information about newly hired and rehired employees to state new hire reporting agencies within a certain time period.

Benefits Plan Administration

Employers that provide certain health care benefit and retirement plans must comply with the Employee Retirement Income Security Act (ERISA). ERISA sets minimum standards for most retirement plans and health plans set up by private employers in order to protect the interests of the employees who participate in such plans.

For example, ERISA:

- Requires plans to provide participants with plan information;
- Sets minimum standards for participation, vesting, benefits accrual and funding;
- Sets out fiduciary responsibilities for managing and controlling plan assets; and
- Regulates and sets standards for reporting requirements.

Health Care Benefits

Employer-sponsored health care benefits are an important part of the overall compensation package used by an employer to attract and retain workers. Employers must comply with several federal laws when designing and administering such benefits.

The Affordable Care Act (ACA) imposes a number of requirements that apply to employer-sponsored group health plans. These requirements have a large influence on health benefit plan design and strategy, touching on issues ranging from required health benefits to bans on benefit limits. Certain employers also may be subject to penalties for failure to offer employees affordable coverage.

Health Information and Privacy

The Health Insurance Portability and Accountability Act (HIPAA) affects the administration of group health plans. The law is designed to:

- Better protect employees' health insurance when they change or leave a job (i.e., provide them with portability);
- Prohibit discrimination based on individual health factors; and
- Ensure the privacy and security of individuals' protected health information (PHI).

HIPAA does not require group health plans to provide any particular benefits, but it does require that any benefits provided be made available to similarly situated individuals. HIPAA also requires employers to provide employees and their dependents an opportunity to enroll in the employer's health plan during a special enrollment period following certain qualifying events, such as when an individual becomes a new dependent through marriage, birth or adoption.

Health Care Continuation

Employers of 20 or more employees that provide group health insurance coverage are required to comply with Consolidated Omnibus Budget Reconciliation Act (COBRA) requirements to provide continued health insurance coverage to employees and certain family members for a limited time after certain qualifying events, such as the loss of a job. COBRA contains strict rules for:

- How and when continuation coverage must be offered and provided;
- How employees and their families may elect continuation coverage; and
- The circumstances that justify terminating continuation coverage.

Social Security and Medicare

The Social Security Act provides workers and their families with income replacement upon retirement, the death of a spouse and permanent disability. Social Security is administered by the Social Security Administration and is split into two programs: (1) Social Security and (2) Medicare.

Benefits provided under Social Security include retirement benefits, disability benefits, death benefits and survivor benefits. Medicare is a federal health insurance program that covers individuals age 65 or over, disabled workers under age 65 and individuals with end-stage renal disease.

Attendance and Leave

Family and Medical Leave

The Family and Medical Leave Act (FMLA) entitles eligible employees of covered employers to unpaid, job-protected leave for the following reasons:

- The employee's inability to work due to a serious health condition;
- To care for an immediate family member with a serious health condition;
- The birth, adoption or foster care of the employee's child; and
- To address a military exigency arising from a family member's military duty or call to military duty.

While an employee is out on FMLA leave, an employer must maintain the employee's health benefits and follow certain rules regarding other employee benefits and compensation. An employee also must be reinstated to their same position (or an equivalent position) when they return from FMLA leave.

Because the FMLA protects employees from discrimination or retaliation based on exercising their FMLA rights, an employer cannot use an employee's use of FMLA leave as a factor in deciding to take an adverse employment action against the employee.

Military Leave

All employers, regardless of size, are required to comply with the Uniformed Services Employment and Reemployment Rights Act (USERRA), which protects the job rights of individuals who voluntarily or involuntarily leave employment to undertake military service or certain types of service in the National Disaster Medical System.

USERRA prohibits an employer from discriminating against past and present members of and applicants to the uniformed services. USERRA also prohibits an employer, based on an individual's past, present or future military status, from denying:

- Initial employment;
- Reemployment;
- Retention in employment;
- Promotion; or
- Any benefit of employment.

In addition, employers may not retaliate against employees for exercising their military leave rights or for participating in USERRA's enforcement process.

Health and Safety

Occupational Safety and Health

The Occupational Safety and Health Act (OSH Act) imposes on all employers a general duty to provide a workplace free from recognized safety and health hazards that could cause death or serious physical harm. In particular, the OSH Act requires employers to:

- Provide employees with safety information and training;
- Post required notices;
- Perform safety checks and make needed corrections;
- Maintain required records; and
- Report workplace safety incidents to the Occupational Safety and Health Administration (OSHA).

OSHA is empowered to conduct workplace inspections and require employers to fix safety problems.

As part of providing a safe working environment, a workplace safety program should be established and maintained. Such programs may include safety training, emergency preparation and accident resolution policies and procedures. Policies and practices regarding safe on-the-job driving also should be implemented and enforced.

Drug-Free Workplace

Employers that receive federal grants or contracts and private organizations that do business with the federal government are required by the Drug-Free Workplace Act to maintain a drug-free workplace. Steps that covered employers are required to take include:

- Publishing and providing employees with a policy statement of the employer's drug-free program;
- Notifying employees of mandatory compliance with the policy;
- Establishing a substance awareness program, including counseling and rehabilitation programs;
- Notifying the federal contracting or granting agency if an employee has been convicted of a criminal drug violation in the workplace; and
- Imposing penalties on employees convicted of a reportable workplace drug conviction.

Organizational Exit

Mass Layoff Notifications

Most employers that employ 100 or more employees must comply with the Worker Adjustment and Retraining Notification Act (WARN Act). The WARN Act requires covered employers to give employees 60 days' advance notice before a plant closure or mass layoff. Employers that fail to give the required notice may be responsible for providing wages and benefits to those employees and may be subject to civil fines and penalties.

In addition to complying with the WARN Act, employers initiating a reduction in force or plant closing must perform due diligence to ensure that company policies (including those prohibiting discrimination and retaliation) and provisions of any collective bargaining agreements are carefully followed.

State Requirements

The following states have additional requirements for this topic under applicable state law:

Alabama	Arkansas	Connecticut	Florida	Idaho
Illinois	Kansas	Maine	Michigan	Missouri
Montana	New Hampshire	New York	Ohio	Pennsylvania
Rhode Island	Tennessee	Vermont	West Virginia	
Alaska	California	Delaware	Georgia	
Indiana	Kentucky	Maryland	Minnesota	
Nebraska	New Jersey	North Carolina	Oklahoma	
South Carolina	Texas	Virginia	Wisconsin	
Arizona	Colorado	District of Columbia	Hawaii	
Iowa	Louisiana	Massachusetts	Mississippi	
Nevada	New Mexico	North Dakota	Oregon	
South Dakota	Utah	Washington	Wyoming	

State of California Prevailing Wages Rates

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GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1 FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

CRAFT: DRIVER (ON/OFF-HAULING TO/FROM CONSTRUCTION SITE)

Determination: C-DT-830-261-6-2016-1
Issue Date: August 22, 2016
Expiration date of determination: September 30, 2016* Effective until superseded by a new determination issued by the Director of Industrial Relations. Contact the Division of Labor Statistics and Research at (415) 703-4774 for the new rates after 10 days from the expiration date, if no subsequent determination is issued.
Localities: All localities within Kern, Monterey, San Luis Obispo, Santa Barbara, and Ventura Counties.

		Employer Payments					Straight-Time		Overtime Hourly Rate	
Classification	Basic Hourly Rate	Health And Welfare	Pension	Vacation And Holiday	Training	Other	Hours	Total Hourly Rate	Daily (1½ X)	Sunday/ Holiday (1½ X)
Driver: Dump Truck	$16.76	$3.04[a]	$2.75	$0.90[b]	$0.64	-	8.0	$24.09	$32.47[c]	$32.47

[a] The contribution applies to all hours until $526.19 is paid for the month.
[b] $1.22 after 2 years of service,
$1.55 after 10 years of service.
[c] Rate applies to work in excess of eight (8) hours daily and forty (40) hours weekly.
* There is no predetermined increase applicable to this determination.

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/PWD. Holiday provisions for current or superseded determinations may be obtained by contacting the Prevailing Wage Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the travel and/or subsistence requirements for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/PWD. Travel and/or subsistence requirements for current or superseded determinations may be obtained by contacting the Prevailing Wage Unit at (415) 703-4774.

GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1 FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

CRAFT: DRIVER (ON/OFF-HAULING TO/FROM CONSTRUCTION SITE)

Determination: C-MT-261-X-258-2018-1
Issue Date: August 22, 2018
Expiration date of determination: September 30, 2018* Effective until superseded by a new determination issued by the Director of Industrial Relations. Contact the Office of the Director - Research Unit at (415) 703-4774 for the new rates after 10 days from the expiration date, if no subsequent determination is issued.
Localities: All localities within Los Angeles, Orange and Ventura Counties.

		Employer Payments					Straight-Time		Overtime Hourly Rate		
Classification	Basic Hourly Rate	Health And Welfare	Pension	Vacation And Holiday[d]	Training	Other	Hours	Total Hourly Rate	Daily (1½ X)	Saturday/ Holiday (1½ X)	Sunday[e] (2 X)
Ready Mix Driver (After 4 yrs of service)	$23.60	$6.00[a]	$3.44	$1.54[bc]	-	-	8.0	$34.58	$46.38	$46.38	$58.18
Ready Mix Driver (After 3 yrs of service)	$22.60	$6.00[a]	$3.44	$1.48[d]	-	-	8.0	$33.52	$44.82	$44.82	$56.12
Ready Mix Driver (After 2 yrs of service)	$21.60	$6.00[a]	$3.44	$1.41[e]	-	-	8.0	$32.45	$43.25	$43.25	$54.05
Ready Mix Driver (After 1 yr of service)	$20.60	$6.00[a]	$3.44	$0.95[f]	-	-	8.0	$30.99	$41.29	$41.29	$51.59
Ready Mix Driver (1 yr or less of service)	$19.60	$6.00[a]	$3.44	$0.00[g]	-	-	8.0	$29.04	$38.84	$38.84	$48.64

[a] The contribution applies to all hours until $1040.50 is paid for the month.
[b] $2.00 after 8 years of service
$2.45 after 15 years of service
[c] Includes $0.64 for Holidays, which would be deducted from the Vacation/Holiday rate if you choose to adopt the paid days off enumerated in the Holiday Provisions.
[d] Includes $0.61 for Holidays, which would be deducted from the Vacation/Holiday rate if you choose to adopt the paid days off enumerated in the Holiday Provisions.
[e] Includes $0.58 for Holidays, which would be deducted from the Vacation/Holiday rate if you choose to adopt the paid days off enumerated in the Holiday Provisions.
[f] Includes $0.55 for Holidays, which would be deducted from the Vacation/Holiday rate if you choose to adopt the paid days off enumerated in the Holiday Provisions.
[g] In addition, $0.53 for Holidays after four (4) months, which would be deducted from the Vacation/Holiday rate if you choose to adopt the paid days off enumerated in the Holiday Provisions.
[h] Emergency work and breakdown on Sundays shall be paid at time and one-half (1½x) the straight time rate.

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/oprl/DPreWageDetermination.htm. Holiday provisions for current or superseded determinations may be obtained by contacting the Office of the Director - Research Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the travel and/or subsistence requirements for the current determinations on the Internet at http://www.dir.ca.gov/oprl/DPreWageDetermination.htm. Travel and/or subsistence requirements for current or superseded determinations may be obtained by contacting the Office of the Director - Research Unit at (415) 703-4774.

GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS
PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

CRAFT: #BUILDING/CONSTRUCTION INSPECTOR AND FIELD SOILS AND MATERIAL TESTER (MULTI-SHIFT)

DETERMINATION: SC-23-63-2-2020-2D2
ISSUE DATE: August 22, 2020
EXPIRATION DATE OF DETERMINATION: June 30, 2021** The rate to be paid for work performed after this date has been determined. If work will extend past this date, the new rate must be paid and should be incorporated in contracts entered into now. Contact the Office of the Director – Research Unit for specific rates at (415) 703-4774.

LOCALITY: All localities within Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, and Ventura counties.

		Employer Payments					Straight – Time		Overtime Hourly Rate		
CLASSIFICATION (Journeyperson)	Basic Hourly Rate	Health and Welfare	Pension (e)	Vacation/ Holiday (a)	Training	Other Payments	Hours (d)	Total Hourly Rate	Daily (b) 1 1/2X	Saturday (c) 1 1/2X	Sunday/ Holiday 2X
Classification Groups											
Group 1	$50.03	$11.85	$12.15	$3.55	$1.05	$0.39	8	$79.02	$104.035	$104.035	$129.05
Group 2	$51.81	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.80	$106.705	$106.705	$132.61
Group 3	$53.81	$11.85	$12.15	$3.55	$1.05	$0.39	8	$82.80	$109.705	$109.705	$136.61

# Indicates an apprenticeable craft. The current apprentice wage rates are available on the Internet @ http://www.dir.ca.gov/OPRL/PWAppWage/PWAppWageStart.asp.

[a] Includes an amount withheld for supplemental dues.

[b] Rate applies to the first 4 overtime hours. All other daily overtime is paid at the Sunday rate.

[c] Rate applies to the first 12 hours worked. All other time is paid at the Sunday rate.

[d] The Third Shift shall work 6.5 hours, exclusive of meal period, for which 8 hours straight-time shall be paid at the non-shift rate, Monday thorugh Friday.

[e] Includes an amount for Annuity.

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm. Holiday provisions for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the travel and/or subsistence provisions for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm. Travel and/or subsistence requirements for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

CLASSIFICATIONS:

GROUP I
Field Soils and Materials Tester
Field Asphaltic Concrete (Soils and Materials Tester)
Field Earthwork (Grading Excavation and Filling)
Roof Inspector
Water Proofer

GROUP II
AWS-CWI Welding Inspector
Building / Construction Inspector
Licensed Grading Inspector
Reinforcing Steel
Reinforced Concrete
Pre-Tension Concrete
Post-Tension Concrete
Structural Steel and Welding Inspector
Glue-Lam and truss Joints
Truss-Type Joint Construction
Shear Wall and Floor System used as diaphragms
Concrete batch Plant
Spray-Applied Fireproofing
Structural masonry

Group III
Nondestructive Testing (NDT)

GENERAL PREVAILING WAGE APPRENTICE RATES

APPRENTICE INFORMATION

Determination: **2020--2** *Issue Date:* **08-22-2020** *Expire Date:* **06-30-2021** ** *Page:* **1**

Craft/Classification: **Building Construction Inspector** *Shift:* **1**

Field Soils Material Tester

Counties: Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, Ventura

Period	Duration Months	OJT Hours	Hourly Basic Rate	Health & Welfare	Pension	Vacation /Holiday	Training	Other	Hourly Total Rate
1		1,000	$30.490	$11.850	$2.500	$3.550	$1.050	$.390	$49.830
2		1,000	$33.030	$11.850	$2.500	$3.550	$1.050	$.390	$52.370
3		1,000	$35.570	$11.850	$12.150	$3.550	$1.050	$.390	$64.560
4		1,000	$38.110	$11.850	$12.150	$3.550	$1.050	$.390	$67.100
5		1,000	$40.650	$11.850	$12.150	$3.550	$1.050	$.390	$69.640
6		1,000	$45.730	$11.850	$12.150	$3.550	$1.050	$.390	$74.720

Footnote(s):

Pension: Includes an amount for Annuity

Vacation and Holiday: Includes an amount for Supplemental Dues.

Other: Includes amounts for Industry Fund, Engineers Contract Compliance Committee (ECCC), Contract Administration Fund and Southern California Partnership for Jobs Fund.

**JOURNEYMAN PREDETERMINED INCREASES:

Effective 7/1/2021: an increase of $2.45 to be allocated to wages and/or employer payments.

There may be corresponding predetermined increases to the apprentices associated with this journeyman craft/classification. Please fax a request to (415) 703-4771 or send to the following address:

Department of Industrial Relations
Office of the Director - Research Unit
P.O. Box 420603
San Francisco, CA 94142-0603

Apprentice Prevailing Wage Rates are paid only to apprentices registered with the State of California, Division of Apprenticeship Standards, for work the registered apprentice performs in his/her specific craft or trade. You may check whether an Apprentices is registered at http://www.dir.ca.gov/DAS/appcertpw/AppCertSearch.asp

GENERAL PREVAILING WAGE APPRENTICE RATES

APPRENTICE INFORMATION

Determination: **2020--2** *Issue Date:* **08-22-2020** *Expire Date:* **06-30-2021** ** *Page:* **2**

Craft/Classification: **Building Construction Inspector** *Shift:* **2**

Field Soils Material Tester

Counties: Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, Ventura

Period	Duration Months	OJT Hours	Hourly Basic Rate	Health & Welfare	Pension	Vacation /Holiday	Training	Other	Hourly Total Rate
1		1,000	$30.990	$11.850	$2.500	$3.550	$1.050	$.390	$50.330
2		1,000	$33.530	$11.850	$2.500	$3.550	$1.050	$.390	$52.870
3		1,000	$36.070	$11.850	$12.150	$3.550	$1.050	$.390	$65.060
4		1,000	$38.610	$11.850	$12.150	$3.550	$1.050	$.390	$67.600
5		1,000	$41.150	$11.850	$12.150	$3.550	$1.050	$.390	$70.140
6		1,000	$46.230	$11.850	$12.150	$3.550	$1.050	$.390	$75.220

Footnote(s):

Pension: Includes an amount for Annuity

Vacation and Holiday: Includes an amount for Supplemental Dues.

Other: Includes amounts for Industry Fund, Engineers Contract Compliance Committee (ECCC), Contract Administration Fund and Southern California Partnership for Jobs Fund.

Rates above are for Special Shift.

**JOURNEYMAN PREDETERMINED INCREASES:

Effective 7/1/2021: an increase of $2.45 to be allocated to wages and/or employer payments.

There may be corresponding predetermined increases to the apprentices associated with this journeyman craft/classification. Please fax a request to (415) 703-4771 or send to the following address:

Department of Industrial Relations
Office of the Director - Research Unit
P.O. Box 420603
San Francisco, CA 94142-0603

Apprentice Prevailing Wage Rates are paid only to apprentices registered with the State of California, Division of Apprenticeship Standards, for work the registered apprentice performs in his/her specific craft or trade. You may check whether an Apprentices is registered at http://www.dir.ca.gov/DAS/appcertpw/AppCertSearch.asp

GENERAL PREVAILING WAGE APPRENTICE RATES

APPRENTICE INFORMATION

Determination: **2020--2** *Issue Date:* **08-22-2020** *Expire Date:* **06-30-2021** ** *Page:* **3**

Craft/Classification: **Building Construction Inspector** *Shift:* **3**

Field Soils Material Tester

Counties: Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, Ventura

Period	Duration Months	OJT Hours	Hourly Basic Rate	Health & Welfare	Pension	Vacation /Holiday	Training	Other	Hourly Total Rate
1		1,000	$31.490	$11.850	$2.500	$3.550	$1.050	$.390	$50.830
2		1,000	$34.030	$11.850	$2.500	$3.550	$1.050	$.390	$53.370
3		1,000	$36.570	$11.850	$12.150	$3.550	$1.050	$.390	$65.560
4		1,000	$39.110	$11.850	$12.150	$3.550	$1.050	$.390	$68.100
5		1,000	$41.650	$11.850	$12.150	$3.550	$1.050	$.390	$70.640
6		1,000	$46.730	$11.850	$12.150	$3.550	$1.050	$.390	$75.720

Footnote(s):

Pension: Includes an amount for Annuity

Vacation and Holiday: Includes an amount for Supplemental Dues.

Other: Includes amounts for Industry Fund, Engineers Contract Compliance Committee (ECCC), Contract Administration Fund and Southern California Partnership for Jobs Fund.

Rates above are for Multi-Shift.

**JOURNEYMAN PREDETERMINED INCREASES:

Effective 7/1/2021: an increase of $2.45 to be allocated to wages and/or employer payments.

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GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS
PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

CRAFT: # CEMENT MASON

DETERMINATION: SC-23-203-2-2020-1
ISSUE DATE: August 22, 2020
EXPIRATION DATE OF DETERMINATION: June 30, 2021* Effective until superseded by a new determination issued by the Director of Industrial Relations. Contact the Office of the Director – Research Unit at (415) 703-4774 for the new rates after ten days after the expiration date if no subsequent determination is issued.

LOCALITY: All localities within Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, and Ventura Counties.

		Employer Payments					Straight-Time		Overtime Hourly Rate		
CLASSIFICATION (JOURNEYPERSON)	Basic Hourly Rate	Health and Welfare	Pension	Vacation/ Holiday	Training	Other Payments	Hours	Total Hourly Rate	Daily 1 1/2X	Saturday[a] 1 1/2X	Sunday/ Holiday 2X
Cement Mason, Curb and Gutter Machine Operator; Clary and Similar Type of Screed Operator (Cement only); Grinding Machine Operator (all types); Jackson Vibratory, Texas Screed and Similar Type Screed Operator; Scoring Machine Operator	$38.50	8.27	9.86	7.14[b]	0.64	0.24	8	64.65	83.90[c]	83.90[c]	103.15
Magnesite, magnesite-terrazzo and mastic composition, Epoxy,. Urethanes and exotic coatings, Dex-O-Tex	$38.62	8.27	9.86	7.14[b]	0.64	0.24	8	64.77	84.08[c]	84.08[c]	103.39
Floating and Troweling Machine Operator	$38.75	8.27	9.86	7.14[b]	0.64	0.24	8	64.90	84.275[c]	84.275[c]	103.65

# Indicates an apprenticeable craft. The current apprentice wage rates are available on the Internet @ http://www.dir.ca.gov/OPRL/PWAppWage/PWAppWageStart.asp.

[a] Saturday in the same work week may be worked at straight-time rate, up to 8 hours on Saturday or when the employee has worked a total of 40 hours in the work week, if it is not reasonably possible for any individual employee on a particular job site to complete 40 hours of work on a 8 hour day, Monday through Friday, due to inclement weather or similar act of God or a situation beyond the control of the contractor.

[b] Includes an amount for supplemental dues.

[c] Rate applies to the first 4 daily overtime hours and the first 12 hours worked on Saturday. All other time is paid at the double time (2X) rate.

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm. Holiday provisions for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the travel and/or subsistence provisions for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm. Travel and/or subsistence requirements for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

GENERAL PREVAILING WAGE APPRENTICE RATES

APPRENTICE INFORMATION

Determination: **2020--2** *Issue Date:* **08-22-2020** *Expire Date:* **06-30-2021** * *Page:* **1**

Craft/Classification: **Cement Mason**

Counties: Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, Ventura

Period	Duration Months	OJT Hours	Hourly Basic Rate	Health & Welfare	Pension	Vacation /Holiday	Training	Other	Hourly Total Rate
1	6		$19.250	$8.270		$2.340	$.640	$.240	$30.740
2	6		$21.180	$8.270		$2.340	$.640	$.240	$32.670
3	6		$23.100	$8.270		$2.340	$.640	$.240	$34.590
4	6		$25.030	$8.270		$7.140	$.640	$.240	$41.320
5	6		$26.950	$8.270	$9.860	$7.140	$.640	$.240	$53.100
6	6		$28.880	$8.270	$9.860	$7.140	$.640	$.240	$55.030
7	6		$30.800	$8.270	$9.860	$7.140	$.640	$.240	$56.950
8	6		$34.650	$8.270	$9.860	$7.140	$.640	$.240	$60.800

Footnote(s):

Vacation - includes an amount for supplemental dues.

Other - includes amounts for Industry Advancement, Contract Administration, and Labor-Management Cooperation Committee Trust.

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GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

CRAFT: #LABORER AND RELATED CLASSIFICATIONS

DETERMINATION: SC-23-102-2-2020-1
ISSUE DATE: August 22, 2020
EXPIRATION DATE OF DETERMINATION: June 30, 2021** The rate to be paid for work performed after this date has been determined. If work will extend past this date, the new rate must be paid and should be incorporated in contracts entered into now. Contact the Office of the Director – Research Unit for specific rates at (415) 703-4774.

LOCALITY: All localities within Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, and Ventura counties.

		Employer Payments					Straight-Time		Overtime Hourly Rates		
Classification [a] (Journeyperson)	Basic Hourly Rate	Health and Welfare	Pension	Vacation/ and Holiday[d]	Training	Other Payment	Hours	Total Hourly Rate	Daily[b] 1 1/2X	Saturday[bc] 1 1/2X	Sunday and Holiday
CLASSIFICATION GROUPS											
Group 1	$36.39	8.00	9.31	4.87	0.70	0.61	8	59.88	78.075	78.075	96.27
Group 2	36.94	8.00	9.31	4.87	0.70	0.61	8	60.43	78.900	78.900	97.37
Group 3	37.49	8.00	9.31	4.87	0.70	0.61	8	60.98	79.725	79.725	98.47
Group 4	39.04	8.00	9.31	4.87	0.70	0.61	8	62.53	82.050	82.050	101.57
Group 5	39.39	8.00	9.31	4.87	0.70	0.61	8	62.88	82.575	82.575	102.27

# Indicates an apprenticeable craft. The current apprentice wage rates are available on the Internet @ http://www.dir.ca.gov/OPRL/PWAppWage/PWAppWageStart.asp.

[a] For classification within each group, see page 14.

[b] Any hours worked over 12 hours in a single workday are double (2) time.

[c] Saturdays in the same work week may be worked at straight-time if job is shut down during work week due to inclement weather or similar Act of God, or a situation beyond the employers control.

[d] Includes an amount per hour worked for supplemental dues

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm. Holiday provisions for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the travel and/or subsistence provisions for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm. Travel and/or subsistence requirements for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

CLASSIFICATION GROUPS

GROUP 1

Boring Machine Helper (Outside)
Certified Confined Space Laborer
Cleaning and Handling of Panel Forms
Concrete Screeding for Rough Strike-Off
Concrete, Water Curing
Demolition Laborer, the cleaning of brick if performed by an employee performing any other phase of demolition work, and the cleaning of lumber
Fiberoptic Installation, Blowing, Splicing, and Testing Technician on public right-of- way only
Fire Watcher, Limbers, Brush Loaders, Pilers and Debris Handlers
Flagman
Gas, Oil and/or Water Pipeline Laborer
Laborer, Asphalt-Rubber Material Loader
Laborer, General or Construction
Laborer, General Cleanup
Laborer, Jetting
Laborer, Temporary Water and Air Lines
Plugging, Filling of Shee-Bolt Holes; Dry Packing of Concrete and Patching
Post Hole Digger (Manual)
Railroad Maintenance, Repair Trackman and Road Beds; Streetcar and Railroad Construction Track Laborers
Rigging and Signaling
Scaler
Slip Form Raisers
Tarman and Mortar Man
Tool Crib or Tool House Laborer
Traffic Control by any method
Water Well Driller Helper
Window Cleaner
Wire Mesh Pulling - All Concrete Pouring Operations

GROUP 2

Asphalt Shoveler
Cement Dumper (on 1 yard or larger mixer and handling bulk cement)
Cesspool Digger and Installer
Chucktender
Chute Man, pouring concrete, the handling of the chute from readymix trucks, such as walls, slabs, decks, floors, foundations, footings, curbs, gutters and sidewalks
Concrete Curer-Impervious Membrane and Form Oiler
Cutting Torch Operator (Demolition)
Fine Grader, Highways and Street Paving, Airport, Runways, and similar type heavy construction
Gas, Oil and/or Water Pipeline Wrapper-Pot Tender and Form Man
Guinea Chaser
Headerboard Man-Asphalt
Installation of all Asphalt Overlay Fabric and Materials used for Reinforcing Asphalt
Laborer, Packing Rod Steel and Pans
Membrane Vapor Barrier Installer
Power Broom Sweepers (small)
Riprap, Stonepaver, placing stone or wet sacked concrete
Roto Scraper and Tiller
Sandblaster (Pot Tender)
Septic Tank Digger and Installer (leadman)

GROUP 2 (continued)

Tank Scaler and Cleaner
Tree Climber, Faller, Chain Saw Operator, Pittsburgh Chipper and similar type Brush Shredders
Underground Laborer, including Caisson Bellower

GROUP 3

Asphalt Installation of all fabrics
Buggymobile Man
Compactor (all types including Tampers, Barko, Wacker)
Concrete Cutting Torch
Concrete Pile Cutter
Driller, Jackhammer, 2 1/2 ft. drill steel or longer
Dri Pak-it Machine
Gas, Oil and/or Water Pipeline Wrapper - 6-inch pipe and over by any method, inside and out
Impact Wrench, Multi-Plate
Kettlemen, Potmen and Men applying asphalt, lay-kold, creosote, lime caustic and similar type materials
Laborer, Fence Erector
Material Hoseman (Walls, Slabs, Floors and Decks)
Operators of Pneumatic, Gas, Electric Tools, Vibrating Machines, Pavement Breakers, Air Blasting, Come-Alongs, and similar mechanical tools not separately classified herein; operation of remote controlled robotic tools in connection with Laborers work
Pipelayer's backup man, coating, grouting, making of joints, sealing, caulking, diapering and including rubber gasket joints, pointing and any and all other services
Power Post Hole Digger
Rock Slinger
Rotary Scarifier or Multiple Head Concrete Chipping Scarifier
Steel Headerboard Man and Guideline Setter
Trenching Machine, Hand Propelled

GROUP 4

Any Worker Exposed to Raw Sewage
Asphalt Raker, Luteman, Ironer, Asphalt Dumpman, and Asphalt Spreader Boxes (all types)
Concrete Core Cutter (walls, floors or ceilings), Grinder or Sander
Concrete Saw Man, Cutting Walls or Flat Work, Scoring old or new concrete
Cribber, Shorer, Lagging, Sheeting and Trench Bracing, Hand-Guided Lagging Hammer
Head Rock Slinger
High Scaler (including drilling of same)
Laborer, Asphalt-Rubber Distributor Bootman
Laser Beam in connection with Laborer's work
Oversize Concrete Vibrator Operator, 70 pounds and over
Pipelayer
Prefabricated Manhole Installer
Sandblaster (Nozzleman), Water Blasting, Porta Shot-Blast
Subsurface Imaging Laborer
Traffic Lane Closure, certified

GROUP 5

Blasters Powderman
Driller
Toxic Waste Removal
Welding, certified or otherwise in connection with Laborers' work

GENERAL PREVAILING WAGE APPRENTICE RATES

APPRENTICE INFORMATION

Determination: **2020--2** *Issue Date:* **08-22-2020** *Expire Date:* **06-30-2021** ** *Page:* **1**

Craft/Classification: **Laborer**

Counties: Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, Ventura

Period	Duration Months	OJT Hours	Hourly Basic Rate	Health & Welfare	Pension	Vacation /Holiday	Training	Other	Hourly Total Rate
1		500	$19.700	$5.600	$2.590	$3.410	$.700	$.610	$32.610
2		500	$21.660	$5.600	$2.590	$3.410	$.700	$.610	$34.570
3		500	$23.630	$5.600	$2.590	$3.410	$.700	$.610	$36.540
4		500	$27.570	$5.600	$2.590	$3.410	$.700	$.610	$40.480
5		500	$31.510	$5.600	$2.590	$3.410	$.700	$.610	$44.420
6		500	$33.480	$5.600	$2.590	$3.410	$.700	$.610	$46.390

Footnote(s):

Note: Apprentice rates are based on JM Laborer Group V rates.

Vacation -- Includes an amount for supplemental dues.

Other -- Includes amounts for Center for Contract Compliance, Industry Fund, and Administrative Trust Fund, Contract Administration Fund and Partnership for Jobs Industry Advancement Fund.

JOURNEYMAN PREDETERMINED INCREASES:

Effective 7/1/2021, there will be an increase of $2.15 to be allocated to wages and or employer payments.

There may be corresponding predetermined increase(s) to the apprentices associated with this journeyman craft/classification. Please fax a request to (415) 703-4771 or send to the following address:

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PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

CRAFT: #OPERATING ENGINEER

DETERMINATION: SC-23-63-2-2020-2
ISSUE DATE: August 22, 2020
EXPIRATION DATE OF DETERMINATION: June 30, 2021** The rate to be paid for work performed after this date has been determined. If work will extend past this date, the new rate must be paid and should be incorporated in contracts entered into now. Contact the Office of the Director – Research Unit for specific rates at (415) 703-4774.

LOCALITY: All localities within Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, and Ventura counties.

		Employer Payments					Straight – Time		Overtime Hourly Rate		
CLASSIFICATION (Journeyperson)	Basic Hourly Rate	Health and Welfare	Pension (e)	Vacation/ Holiday (a)	Training	Other Payments	Hours	Total Hourly Rate	Daily (c)	Saturday (d)	Sunday/ Holiday
									1 1/2X	1 1/2X	2X
Classification Groups (b)											
Group 1	$48.25	$11.85	$12.15	$3.55	$1.05	$0.39	8	$77.24	$101.365	$101.365	$125.49
Group 2	$49.03	$11.85	$12.15	$3.55	$1.05	$0.39	8	$78.02	$102.535	$102.535	$127.05
Group 3	$49.32	$11.85	$12.15	$3.55	$1.05	$0.39	8	$78.31	$102.970	$102.970	$127.63
Group 4	$50.81	$11.85	$12.15	$3.55	$1.05	$0.39	8	$79.80	$105.205	$105.205	$130.61
Group 6	$51.03	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.02	$105.535	$105.535	$131.05
Group 8	$51.14	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.13	$105.700	$105.700	$131.27
Group 10	$51.26	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.25	$105.880	$105.880	$131.51
Group 12	$51.43	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.42	$106.135	$106.135	$131.85
Group 13	$51.53	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.52	$106.285	$106.285	$132.05
Group 14	$51.56	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.55	$106.330	$106.330	$132.11
Group 15	$51.64	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.63	$106.450	$106.450	$132.27
Group 16	$51.76	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.75	$106.630	$106.630	$132.51
Group 17	$51.93	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.92	$106.885	$106.885	$132.85
Group 18	$52.03	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.02	$107.035	$107.035	$133.05
Group 19	$52.14	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.13	$107.200	$107.200	$133.27
Group 20	$52.26	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.25	$107.380	$107.380	$133.51
Group 21	$52.43	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.42	$107.635	$107.635	$133.85
Group 22	$52.53	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.52	$107.785	$107.785	$134.05
Group 23	$52.64	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.63	$107.950	$107.950	$134.27
Group 24	$52.76	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.75	$108.130	$108.130	$134.51
Group 25	$52.93	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.92	$108.385	$108.385	$134.85

# Indicates an apprenticeable craft. The current apprentice wage rates are available on the Internet @ http://www.dir.ca.gov/OPRL/PWAppWage/PWAppWageStart.asp.

[a] Includes an amount withheld for supplemental dues.

[b] For classifications within each group, see pages 8 and 9.

[c] Rate applies to the first 4 overtime hours. All other daily overtime is paid at the Sunday rate.

[d] Rate applies to the first 12 hours worked. All other time is paid at the Sunday rate.

[e] Includes an amount for Annuity.

NOTE: For Special Shift and Multi-Shift, see pages 9A and 9B.

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm. Holiday provisions for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the travel and/or subsistence provisions for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm. Travel and/or subsistence requirements for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

DETERMINATION: SC-23-63-2-2020-2

CLASSIFICATIONS:

GROUP 1

Bargeman
Brakeman
Compressor Operator
Ditchwitch, with seat or similar type equipment
Elevator Operator - Inside
Engineer Oiler
Forklift Operator (includes loed, lull or similar types – under 5 tons)
Generator Operator
Generator, Pump or Compressor Plant Operator
Heavy Duty Repairman Helper
Pump Operator
Signalman
Switchman

GROUP 2

Asphalt-Rubber Plant Operator (Nurse Tank Operator)
Concrete Mixer Operator - Skip Type
Conveyor Operator
Fireman
Forklift Operator (includes loed, lull or similar types – over 5 tons)
Hydrostatic Pump Operator
Oiler Crusher (Asphalt or Concrete Plant)
Petromat Laydown Machine
RJU Side Dump Jack
Rotary Drill Helper (Oilfield)
Screening and Conveyor Machine Operator (or similar types)
Skiploader (Wheel type up to 3/4 yd. without attachment)
Tar Pot Fireman
Temporary Heating Plant Operator
Trenching Machine Oiler

GROUP 3

Asphalt Rubber Blend Operator
Bobcat or similar type (Skid Steer, with all attachments)
Equipment Greaser (rack)
Ford Ferguson (with dragtype attachments)
Helicopter Radioman (ground)
Stationary Pipe Wrapping and Cleaning Machine Operator

GROUP 4

Asphalt Plant Fireman
Backhoe Operator (mini-max or similar type)
Boring Machine Operator
Boring System Electronic Tracking Locator
Boxman or Mixerman (asphalt or concrete)
Chip Spreading Machine Operator
Concrete Cleaning Decontamination Machine Operator
Concrete Pump Operator (small portable)
Drilling Machine Operator, Small Auger types (Texoma Super Economatic, or similar types - Hughes 100 or 200, or similar types - drilling depth of 30 maximum)
Equipment Greaser (grease truck)
Excavator Track/Rubber-Tired- with all attachments (Operating weight under 21,000 lbs)
Guard Rail Post Driver Operator
Highline Cableway Signalman
Hydra-Hammer-Aero Stomper
Hydraulic Casing Oscillator Operator – drilling depth of 30’ maximum
Micro Tunneling Operator (above ground tunnel)
Power Concrete Curing Machine Operator
Power Concrete Saw Operator
Power - Driver Jumbo Form Setter Operator
Power Sweeper Operator
Rock Wheel Saw/Trencher
Roller Operator (compacting)
Screed Operator (asphalt or concrete)
Trenching Machine Operator (up to 6ft.)
Vacuum or Muck Truck

GROUP 5 (for multi-shift rate, see page 9B)

Equipment Greaser (Grease Truck/Multi-Shift)

GROUP 6

Articulating Material Hauler
Asphalt Plant Engineer
Batch Plant Operator
Bit Sharpener
Concrete Joint Machine Operator (canal and similar type)
Concrete Placer Operator
Concrete Planer Operator
Dandy Digger
Deck Engine Operator
Deck Engineer
Derrickman (oilfield type)
Drilling Machine Operator, Bucket or Auger types (Calweld 100 bucket or similar types - Watson 1000 auger or similar types - Texoma 330, 500 or 600 auger or similar types - drilling depth of 45' maximum)
Drilling Machine Operator (including water wells)
Force Feed Loader
Hydraulic Casing Oscillator Operator – drilling depth of 45’ maximum
Hydrographic Seeder Machine Operator (straw, pulp or seed)
Jackson Track Maintainer, or similar type
Kalamazoo Switch Tamper, or similar type
Machine Tool Operator
Maginnis Internal Full Slab Vibrator
Mechanical Berm, Curb or Gutter (concrete or asphalt)
Mechanical Finisher Operator (concrete, Clary-Johnson-Bidwell or similar)
Micro Tunnel System Operator (below ground)
Pavement Breaker Operator
Railcar Mover
Road Oil Mixing Machine Operator
Roller Operator (asphalt or finish)
Rubber-Tired Earthmoving Equipment (single engine, up to and including 25 yds. struck)
Self-Propelled Tar Pipelining Machine Operator
Skiploader Operator (crawler and wheel type, over 3/4 yds. and up to and including 1 1/2 yds.)
Slip Form Pump Operator (power driven hydraulic lifting device for concrete forms)
Tractor Operator - Bulldozer, Tamper-Scraper (single engine, up to 100 H.P. flyweel and similar types, up to and including D-5 and similar types)
Tugger Hoist Operator (1 drum)
Ultra High Pressure Waterjet Cutting Tool System Operator
Vacuum Blasting Machine Operator
Volume Mixer Operator
Welder – General

GROUP 7 (for multi-shift rate, see page 9B)

Welder – General (Multi-Shift)

GROUP 8

Asphalt or Concrete Spreading Operator (tamping or finishing)
Asphalt Paving Machine Operator (barber greene or similar type, one (1) Screedman)
Asphalt-Rubber Distributor Operator
Backhoe Operator (up to and including 3/4 yds.) small ford, case or similar
Backhoe Operator (over 3/4 yd. and up to 5 cu. yds. M.R.C.)
Barrier Rail Mover (BTM Series 200 or similar types)
Cast in Place Pipe Laying Machine Operator
Cold Foamed Asphalt Recycler
Combination Mixer and Compressor Operator (gunite work)
Compactor Operator - Self Propelled
Concrete Mixer Operator - Paving
Crushing Plant Operator
Drill Doctor
Drilling Machine Operator, Bucket or Auger types (Calweld 150 bucket or similar types - Watson 1500, 2000, 2500 auger or similar types - Texoma 700, 800 auger or similar types - drilling depth of 60' maximum)
Elevating Grader Operator
Excavator Track/Rubber-Tired- with all attachments (Operating Weight 21,000 lbs - 100,000 lbs)
Global Positioning System/GPS (or Technician)
Grade Checker
Gradall Operator
Grouting Machine Operator
Heavy Duty Repairman/Pump Installer
Heavy Equipment Robotics Operator
Hydraulic Casing Oscillator Operator – drilling depth of 60’ maximum
Hydraulic Operated Grout Plant (excludes hand loading)
Kalamazoo Ballast Regulator or similar type
Klemm Drill Operator or similar types
Kolman Belt Loader and similar type
Le Tourneau Blob Compactor or similar type
Lo Drill
Loader Operator (Athey, Euclid, Sierra and similar types)
Master Environmental Maintenance Mechanic
Mobark Chipper or similiar types
Ozzie Padder or similar types
P.C. 490 Slot Saw
Pneumatic Concrete Placing Machine Operator (Hackley-Presswell or similar type)
Prentice 721E Hydro-Ax
Pumpcrete Gun Operator
Rock Drill or Similiar Types (see Miscellaneous Provision #4 for additional information regarding this classification)
Rotary Drill Operator (excluding caison type)
Rubber-Tired Earth Moving Equipment Operator (single engine, caterpillar, euclid, athey wagon, and similar types with any and all attachments over 25 yds. and up to and including 50 cu. yds. struck)
Rubber-Tired Earth Moving Equipment Operator (multiple engine - up to and including 25 yds. struck)
Rubber-Tired Scraper Operator (self-loading paddle wheel type - John Deere, 1040 and similar single unit)
Self-Propelled Curb and Gutter Machine Operator
Shuttle Buggy
Skiploader Operator (crawler and wheel type over 1 1/2 yds. up to and including 6 1/2 yds.)
Soil Remediation Plant Operator (CMI, Envirotech or Similar)
Soil Stabilizer and Reclaimer (WR-2400)
Somero SXP Laser Screed
Speed Swing Operator
Surface Heaters and Planer Operator
Tractor Compressor Drill Combination Operator

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GROUP 8 CONT.

Tractor Operator (any type larger than D-5 - 100 flyweel H.P. and over, or similar – bulldozer, tamper, scraper and push tractor, single engine)

Tractor Operator (boom attachments)

Traveling Pipe Wrapping, Cleaning and Bending Machine Operator

Trenching Machine Operator (over 6 ft. depth capacity, manufacturer's rating)

Trenching Machine with Road Miner Attachment (over 6ft. depth capacity, manufacturer's rating - Oiler or Journeyman Trainee required)

Ultra High Pressure Waterjet Cutting Tool System Mechanic

Water Pull (compaction)

GROUP 9 (for multi-shift rate, see page 9B)

Heavy Duty Repairman (Multi-Shift)

GROUP 10

Backhoe Operator (over 5 cu. yds. M.R.C.)

Drilling Machine Operator, Bucket or Auger types (Calweld 200 B bucket or similar types - Watson 3000 or 5000 auger or similar types - Texoma 900 auger or similar types - drilling depth of 105' maximum)

Dual Drum Mixer

Dynamic Compactor LDC350 or similar types

Heavy Duty Repairman-Welder combination

Hydraulic Casing Oscillator Operator – drilling depth of 105' maximum

Monorail Locomotive Operator (diesel, gas or electric)

Motor Patrol - Blade Operator (single engine)

Multiple Engine Tractor Operator (euclid and similar type - except quad 9 cat.)

Pneumatic Pipe Ramming Tool and similar types

Pre-stressed Wrapping Machine Operator (2 Operators required)

Rubber - Tired Earth Moving Equipment Operator (single engine, over 50 yds. struck)

Rubber - Tired Earth Moving Equipment Operator (multiple engine, euclid caterpillar and similar - over 25 yds. and up to 50 yds. struck)

Tower Crane Repairman

Tractor Loader Operator (crawler and wheel-type over 6 1/2 yds.)

Welder - Certified

Woods Mixer Operator (and similar pugmill equipment)

GROUP 11 (for multi-shift rate, see page 9B)

Heavy Duty Repairman – Welder Combination (Multi-Shift)

Welder – Certified (Multi-Shift)

GROUP 12

Auto Grader Operator

Automatic Slip Form Operator

Backhoe Operator (over 7 cu. yds. M.R.C.)

Drilling Machine Operator, Bucket or Auger types (Calweld, auger 200 CA or similar types - watson, auger 6000 or similar types - hughes super duty, auger 200 or similar types - drilling depth of 175' maximum)

Excavator Track/Rubber Tired- with all attachments (Operating Weight 100,000 lbs. - 200,000 lbs)

Hoe Ram or similar with compressor

Hydraulic Casing Oscillator Operator – drilling depth of 175' maximum

Mass Excavator Operator – less than 750 cu. yds.

Mechanical Finishing Machine Operator

Mobile Form Traveler Operator

Motor Patrol Operator (multi-engine)

Pipe Mobile Machine Operator

Rubber-Tired Earth Moving Equipment Operator (multiple engine, euclid, caterpillar and similar type, over 50 cu. yds. struck)

Rubber-Tired Self-Loading Scraper Operator (paddle-wheel-auger type self-loading - (two (2) or more units)

GROUP 13

Rubber-Tired Earth Moving Equipment Operator, Operating Equipment with the Push-Pull System (single engine, up to and including 25 yds. struck)

GROUP 14

Canal Liner Operator

Canal Trimmer Operator

Drilling Machine Operator, Bucket or Auger types (Calweld, auger 200 CA or similar types - watson, auger 6000 or similar types - hughes super duty, auger 200 or similar types - drilling depth of 300' maximum)

Remote Controlled Earth Moving Operator ($1.00 per hour additional to base rate)

Wheel Excavator Operator (over 750 cu. yds. per hour)

GROUP 15

Rubber-Tired Earth Moving Equipment Operator, Operating Equipment with the Push-Pull System (single engine, caterpillar, euclid, athey wagon, and similar types with any and all attachments over 25 yds. and up to and including 50 cu. yds. struck)

Rubber-Tired Earth Moving Equipment Operator, Operating Equipment with the Push-Pull System (multiple engine - up to and including 25 yds. struck)

GROUP 16

Excavator Track/Rubber Tired- with all attachments (Operating Weight exceeding 200,000 lbs.)

Rubber-Tired Earth Moving Equipment Operator, Operating Equipment with the Push-Pull System (single engine, over 50 yds. struck)

Rubber-Tired Earth Moving Equipment Operator, Operating Equipment with the Push-Pull System (multiple engine, euclid, caterpillar, and similar, over 25 yds. and up to 50 yds. struck)

GROUP 17

Rubber-Tired Earth Moving Equipment Operator, Operating Equipment with the Push-Pull System (multiple engine, euclid, caterpillar, and similar type, over 50 cu. yds. struck)

Tandem Tractor Operator (operating crawler type tractors in tandem - Quad 9 and similar type)

GROUP 18

Rubber-Tired Earth Moving Equipment Operator, Operating in Tandem (scrapers, belly dumps, and similar types in any combination, excluding compaction units - single engine, up to and including 25 yds. struck)

GROUP 19

Rotex Concrete Belt Operator

Rubber-Tired Earth Moving Equipment Operator, Operating in Tandem (scrapers, belly dumps, and similar types in any combination, excluding compaction units - single engine, caterpillar, euclid, athey wagon, and similar types with any and all attachments over 25 yds. and up to and including 50 cu. yds. struck)

Rubber-Tired Earth Moving Equipment Operator, Operating in Tandem (scrapers, belly dumps, and similar types in any combination, excluding compaction units - multiple engines, up to and including 25 yds. struck)

GROUP 20

Rubber-Tired Earth Moving Equipment Operator, Operating in Tandem (scrapers, belly dumps, and similar types in any combination, excluding compaction units - single engine, over 50 yds. struck)

Rubber-Tired Earth Moving Equipment Operator, Operating in Tandem (scrapers, belly dumps, and similar types in any combination, excluding compaction units - multiple engine, euclid, caterpillar and similar, over 25 yds. and up to 50 yds. struck)

Drilling Machine Operator, Bucket or Auger types (Calweld, auger 200 CA or similar types - watson,

GROUP 21

Rubber-Tired Earth Moving Equipment Operator, Operating in Tandem (scrapers, belly dumps, and similar types in any combination, excluding compaction units - multiple engine, euclid, caterpillar and similar type, over 50 cu. yds. struck)

GROUP 22

Rubber-Tired Earth Moving Equipment Operator, Operating Equipment with the Tandem Push-Pull System (single engine, up to and including 25 yds. struck)

GROUP 23

Rubber-Tired Earth Moving Equipment Operator, Operating Equipment with the Tandem Push-Pull System (single engine, caterpillar, euclid, athey wagon, and similar types with any and all attachments over 25 yds. and up to and including 50 cu. yds. struck)

Rubber-Tired Earth Moving Equipment Operator, Operating Equipment with the Tandem Push-Pull System (multiple engine, up to and including 25 yds. struck)

GROUP 24

Rubber-Tired Earth Moving Equipment Operator, Operating Equipment with the Tandem Push-Pull System (single engine, over 50 yds. Struck)

Rubber-Tired Earth Moving Equipment Operator, Operating Equipment with the Tandem Push-Pull System (multiple engine, euclid, caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 25

Concrete Pump Operator-Truck Mounted

Pedestal Concrete Pump Operator

Rubber-Tired Earth Moving Equipment Operator, Operating Equipment with the Tandem Push-Pull System (multiple engine, euclid, caterpillar and similar over 50 cu. yds struck)

MISCELLANEOUS PROVISIONS:

1. Operators on hoists with three drums shall receive fifteen cents (15¢) per hour additional pay to the regular rate of pay. The additional pay shall be added to the regular rate and become the base rate for the entire shift.
2. All heavy duty repairman and heavy duty combination shall receive one dollar ($1.00) per hour tool allowance in addition to their regular rate of pay and this shall become their base rate of pay.
3. Employees required to suit up and work in a hazardous material environment, shall receive Two Dollars ($2.00) per hour in addition to their regular rate of pay, and that rate shall become the basic hourly rate of pay.
4. A review of rock drilling is currently pending. The minimum acceptable rate of pay for this classification or type of work on public works projects is Laborer and Related Classifications/Group 5 (Driller) as published on pages 13 and 14 of the Director's General Prevailing Wage Determinations. However, the published rate for the craft/classification of Operating Engineer/Group 8 (Rock Drill or Similar Types) may be used by contractors to perform rock drilling on public works projects.

GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS
PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

CRAFT: #OPERATING ENGINEER (Special Shift)

DETERMINATION: SC-23-63-2-2020-2
ISSUE DATE: August 22, 2020
EXPIRATION DATE OF DETERMINATION: June 30, 2021** The rate to be paid for work performed after this date has been determined. If work will extend past this date, the new rate must be paid and should be incorporated in contracts entered into now. Contact the Office of the Director – Research Unit for specific rates at (415) 703-4774.

LOCALITY: All localities within Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, and Ventura counties.

		Employer Payments					Straight – Time		Overtime Hourly Rate		
CLASSIFICATION (Journeyperson)	Basic Hourly Rate	Health and Welfare	Pension (e)	Vacation/ Holiday (a)	Training	Other Payments	Hours	Total Hourly Rate	Daily (c)	Saturday (d)	Sunday/ Holiday
									1 1/2X	1 1/2X	2X
Classification Groups (b)											
Group 1	$48.75	$11.85	$12.15	$3.55	$1.05	$0.39	8	$77.74	$102.115	$102.115	$126.49
Group 2	$49.53	$11.85	$12.15	$3.55	$1.05	$0.39	8	$78.52	$103.285	$103.285	$128.05
Group 3	$49.82	$11.85	$12.15	$3.55	$1.05	$0.39	8	$78.81	$103.720	$103.720	$128.63
Group 4	$51.31	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.30	$105.955	$105.955	$131.61
Group 6	$51.53	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.52	$106.285	$106.285	$132.05
Group 8	$51.64	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.63	$106.450	$106.450	$132.27
Group 10	$51.76	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.75	$106.630	$106.630	$132.51
Group 12	$51.93	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.92	$106.885	$106.885	$132.85
Group 13	$52.03	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.02	$107.035	$107.035	$133.05
Group 14	$52.06	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.05	$107.080	$107.080	$133.11
Group 15	$52.14	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.13	$107.200	$107.200	$133.27
Group 16	$52.26	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.25	$107.380	$107.380	$133.51
Group 17	$52.43	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.42	$107.635	$107.635	$133.85
Group 18	$52.53	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.52	$107.785	$107.785	$134.05
Group 19	$52.64	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.63	$107.950	$107.950	$134.27
Group 20	$52.76	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.75	$108.130	$108.130	$134.51
Group 21	$52.93	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.92	$108.385	$108.385	$134.85
Group 22	$53.03	$11.85	$12.15	$3.55	$1.05	$0.39	8	$82.02	$108.535	$108.535	$135.05
Group 23	$53.14	$11.85	$12.15	$3.55	$1.05	$0.39	8	$82.13	$108.700	$108.700	$135.27
Group 24	$53.26	$11.85	$12.15	$3.55	$1.05	$0.39	8	$82.25	$108.880	$108.880	$135.51
Group 25	$53.43	$11.85	$12.15	$3.55	$1.05	$0.39	8	$82.42	$109.135	$109.135	$135.85

# Indicates an apprenticeable craft. The current apprentice wage rates are available on the Internet @ http://www.dir.ca.gov/OPRL/PWAppWage/PWAppWageStart.asp.

[a] Includes an amount withheld for supplemental dues.

[b] For classifications within each group, see pages 8 and 9.

[c] Rate applies to the first 4 overtime hours. All other daily overtime is paid at the Sunday rate.

[d] Rate applies to the first 12 hours worked. All other time is paid at the Sunday rate.

[e] Includes an amount for Annuity.

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm. Holiday provisions for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the travel and/or subsistence provisions for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm. Travel and/or subsistence requirements for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS
PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

CRAFT: #OPERATING ENGINEER (Multi-Shift)

DETERMINATION: SC-23-63-2-2020-2
ISSUE DATE: August 22, 2020
EXPIRATION DATE OF DETERMINATION: June 30, 2021** The rate to be paid for work performed after this date has been determined. If work will extend past this date, the new rate must be paid and should be incorporated in contracts entered into now. Contact the Office of the Director – Research Unit for specific rates at (415) 703-4774.

LOCALITY: All localities within Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, and Ventura counties.

		Employer Payments					Straight – Time		Overtime Hourly Rate		
CLASSIFICATION (Journeyperson)	Basic Hourly Rate	Health and Welfare	Pension (f)	Vacation/ Holiday (a)	Training	Other Payments	Hours (e)	Total Hourly Rate	Daily (c)	Saturday (d)	Sunday/ Holiday
									1 1/2X	1 1/2X	2X
Classification Groups (b)											
Group 1	$49.25	$11.85	$12.15	$3.55	$1.05	$0.39	8	$78.24	$102.865	$102.865	$127.49
Group 2	$50.03	$11.85	$12.15	$3.55	$1.05	$0.39	8	$79.02	$104.035	$104.035	$129.05
Group 3	$50.32	$11.85	$12.15	$3.55	$1.05	$0.39	8	$79.31	$104.470	$104.470	$129.63
Group 4	$51.81	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.80	$106.705	$106.705	$132.61
Group 5	$51.91	$11.85	$12.15	$3.55	$1.05	$0.39	8	$80.90	$106.855	$106.855	$132.81
Group 6	$52.03	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.02	$107.035	$107.035	$133.05
Group 7	$52.13	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.12	$107.185	$107.185	$133.25
Group 8	$52.14	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.13	$107.200	$107.200	$133.27
Group 9	$52.24	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.23	$107.350	$107.350	$133.47
Group 10	$52.26	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.25	$107.380	$107.380	$133.51
Group 11	$52.36	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.35	$107.530	$107.530	$133.71
Group 12	$52.43	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.42	$107.635	$107.635	$133.85
Group 13	$52.53	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.52	$107.785	$107.785	$134.05
Group 14	$52.56	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.55	$107.830	$107.830	$134.11
Group 15	$52.64	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.63	$107.950	$107.950	$134.27
Group 16	$52.76	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.75	$108.130	$108.130	$134.51
Group 17	$52.93	$11.85	$12.15	$3.55	$1.05	$0.39	8	$81.92	$108.385	$108.385	$134.85
Group 18	$53.03	$11.85	$12.15	$3.55	$1.05	$0.39	8	$82.02	$108.535	$108.535	$135.05
Group 19	$53.14	$11.85	$12.15	$3.55	$1.05	$0.39	8	$82.13	$108.700	$108.700	$135.27
Group 20	$53.26	$11.85	$12.15	$3.55	$1.05	$0.39	8	$82.25	$108.880	$108.880	$135.51
Group 21	$53.43	$11.85	$12.15	$3.55	$1.05	$0.39	8	$82.42	$109.135	$109.135	$135.85
Group 22	$53.53	$11.85	$12.15	$3.55	$1.05	$0.39	8	$82.52	$109.285	$109.285	$136.05
Group 23	$53.64	$11.85	$12.15	$3.55	$1.05	$0.39	8	$82.63	$109.450	$109.450	$136.27
Group 24	$53.76	$11.85	$12.15	$3.55	$1.05	$0.39	8	$82.75	$109.630	$109.630	$136.51
Group 25	$53.93	$11.85	$12.15	$3.55	$1.05	$0.39	8	$82.92	$109.885	$109.885	$136.85

# Indicates an apprenticeable craft. The current apprentice wage rates are available on the Internet @ http://www.dir.ca.gov/OPRL/PWAppWage/PWAppWageStart.asp.

[a] Includes an amount withheld for supplemental dues.

[b] For classifications within each group, see pages 8 and 9.

[c] Rate applies to the first 4 overtime hours. All other daily overtime is paid at the Sunday rate.

[d] Rate applies to the first 12 hours worked. All other time is paid at the Sunday rate.

[e] The Third Shift shall work 6.5 hours, exclusive of meal period, for which 8 hours straight-time shall be paid at the non-shift rate, Monday thorugh Friday.

[f] Includes an amount for Annuity.

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm. Holiday provisions for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the travel and/or subsistence provisions for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm. Travel and/or subsistence requirements for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

GENERAL PREVAILING WAGE APPRENTICE RATES

APPRENTICE INFORMATION

Determination: **2020--2** *Issue Date:* **08-22-2020** *Expire Date:* **06-30-2021** ** *Page:* **1**

Craft/Classification: **Operating Engineer** *Shift:* **1**

Counties: Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, Ventura

Period	Duration Months	OJT Hours	Hourly Basic Rate	Health & Welfare	Pension	Vacation /Holiday	Training	Other	Hourly Total Rate
1		1,000	$30.620	$11.850	$2.500	$3.550	$1.050	$.390	$49.960
2		1,000	$33.170	$11.850	$2.500	$3.550	$1.050	$.390	$52.510
3		1,000	$35.720	$11.850	$12.150	$3.550	$1.050	$.390	$64.710
4		1,000	$38.270	$11.850	$12.150	$3.550	$1.050	$.390	$67.260
5		1,000	$40.820	$11.850	$12.150	$3.550	$1.050	$.390	$69.810
6		1,000	$45.930	$11.850	$12.150	$3.550	$1.050	$.390	$74.920

Footnote(s):

Operating Engineers Group 13 through 25 apprentice wage rates are based on the applicable journeyman's wage rates for that group.

Pension: Includes an amount for Annuity.

Vacation & Holiday: Includes an amount for Supplemental Dues.

Other: Includes amounts for Industry Fund, Engineers Contract Compliance Committee (ECCC), Contract Administration Fund, and Southern California Partnership for Jobs Fund.

Rates above also apply to crafts:
Tunnel Operating Engineer
Crane, Pile Driver, and Hoisting Equipment Operating Engineer

**JOURNEYMAN PREDETERMINED INCREASES:

Effective 7/1/2021: an increase of $2.45 to be allocated to wages and/or employer payments.

There may be corresponding predetermined increases to the apprentices associated with this journeyman craft/classification. Please fax a request to (415) 703-4771 or send to the following address:

Department of Industrial Relations
Office of the Director - Research Unit
P.O. Box 420603
San Francisco, CA 94142-0603

Apprentice Prevailing Wage Rates are paid only to apprentices registered with the State of California, Division of Apprenticeship Standards, for work the registered apprentice performs in his/her specific craft or trade. You may check whether an Apprentices is registered at http://www.dir.ca.gov/DAS/appcertpw/AppCertSearch.asp

GENERAL PREVAILING WAGE APPRENTICE RATES

APPRENTICE INFORMATION

Determination: **2020--2** *Issue Date:* **08-22-2020** *Expire Date:* **06-30-2021** ** *Page:* **2**

Craft/Classification: **Operating Engineer** *Shift:* **2**

Special Shift

Counties: Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, Ventura

Period	Duration Months	OJT Hours	Hourly Basic Rate	Health & Welfare	Pension	Vacation /Holiday	Training	Other	Hourly Total Rate
1		1,000	$31.120	$11.850	$2.500	$3.550	$1.050	$.390	$50.460
2		1,000	$33.670	$11.850	$2.500	$3.550	$1.050	$.390	$53.010
3		1,000	$36.220	$11.850	$12.150	$3.550	$1.050	$.390	$65.210
4		1,000	$38.770	$11.850	$12.150	$3.550	$1.050	$.390	$67.760
5		1,000	$41.320	$11.850	$12.150	$3.550	$1.050	$.390	$70.310
6		1,000	$46.430	$11.850	$12.150	$3.550	$1.050	$.390	$75.420

Footnote(s):

Operating Engineers Group 13 through 25 apprentice wage rates are based on the applicable journeyman's wage rates for that group.

Pension: Includes an amount for Annuity.

Vacation & Holiday: Includes an amount for Supplemental Dues.

Other: Includes amounts for Industry Fund, Engineers Contract Compliance Committee (ECCC), Contract Administration Fund, and Southern California Partnership for Jobs Fund.

Rates above also apply to crafts:
Tunnel Operating Engineer
Crane, Pile Driver, and Hoisting Equipment Operating Engineer

**JOURNEYMAN PREDETERMINED INCREASES:

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GENERAL PREVAILING WAGE APPRENTICE RATES

APPRENTICE INFORMATION

Determination: **2020--2** *Issue Date:* **08-22-2020** *Expire Date:* **06-30-2021** ** *Page:* **3**

Craft/Classification: **Operating Engineer** *Shift:* **3**

Multi-shift

Counties: Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, Ventura

Period	Duration Months	OJT Hours	Hourly Basic Rate	Health & Welfare	Pension	Vacation /Holiday	Training	Other	Hourly Total Rate
1		1,000	$31.620	$11.850	$2.500	$3.550	$1.050	$.390	$50.960
2		1,000	$34.170	$11.850	$2.500	$3.550	$1.050	$.390	$53.510
3		1,000	$36.720	$11.850	$12.150	$3.550	$1.050	$.390	$65.710
4		1,000	$39.270	$11.850	$12.150	$3.550	$1.050	$.390	$68.260
5		1,000	$41.820	$11.850	$12.150	$3.550	$1.050	$.390	$70.810
6		1,000	$46.930	$11.850	$12.150	$3.550	$1.050	$.390	$75.920

Footnote(s):

Operating Engineers Group 13 through 25 apprentice wage rates are based on the applicable journeyman's wage rates for that group.

Pension: Includes an amount for Annuity

Vacation & Holiday: Includes an amount for Supplemental Dues.

Other: Includes amounts for Industry Fund, Engineers Contract Compliance Committee (ECCC), Contract Administration Fund, and Southern California Partnership for Jobs Fund.

Rates above are for Multi-shift

Rates above also apply to crafts:
Tunnel Operating Engineer
Crane, Pile Driver, and Hoisting Equipment Operating Engineer

**JOURNEYMAN PREDETERMINED INCREASES:

Effective 7/1/2021: an increase of $2.45 to be allocated to wages and/or employer payments.

There may be corresponding predetermined increases to the apprentices associated with this journeyman craft/classification. Please fax a request to (415) 703-4771 or send to the following address:

Department of Industrial Relations
Office of the Director - Research Unit
P.O. Box 420603
San Francisco, CA 94142-0603

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GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS
PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

CRAFT: # PARKING AND HIGHWAY IMPROVEMENT
(STRIPING, SLURRY AND SEAL COAT OPERATIONS-LABORER)

DETERMINATION: SC-23-102-6-2020-1
ISSUE DATE: August 22, 2020
EXPIRATION DATE OF DETERMINATION: June 30, 2021** The rate to be paid for work performed after this date has been determined. If work will extend past this date, the new rate must be paid and should be incorporated in contracts entered into now. Contact the Office of the Director – Research Unit for specific rates at (415) 703-4774.

LOCALITY: All localities within Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara and Ventura counties.

		Employer Payments					Straight-Time		Overtime Hourly Rates		
Classification (Journeyperson)	Basic Hourly Rate	Health and Welfare	Pension	Vacation/ Holiday	Training	Other	Hours [b]	Total Hourly Rate	Daily 1 1/2X	6th & 7th Day [c] 1 1/2X	Holiday 2X
CLASSIFICATION GROUPS											
Group 1	$39.06	$8.00	$6.26	$5.11[a]	$1.32	$0.50	8	$60.25	$79.78	$79.78	$99.31
Group 2	40.36	8.00	6.26	5.11[a]	1.32	0.50	8	61.55	81.73	81.73	101.91
Group 3	42.37	8.00	6.26	5.11[a]	1.32	0.50	8	63.56	84.745	84.745	105.93
Group 4	44.11	8.00	6.26	5.11[a]	1.32	0.50	8	65.30	87.355	87.355	109.41

# Indicates an apprenticeable craft. The current apprentice wage rates are available on the Internet @ http://www.dir.ca.gov/OPRL/PWAppWage/PWAppWageStart.asp. To obtain any apprentice wage rates as of July 1, 2008 and prior to September 27, 2012, please contact the Division of Apprenticeship Standards or refer to the Division of Apprenticeship Standards' website at http://www.dir.ca.gov/das/das.html.

[a] Includes an amount per hour worked for Supplemental Dues.

[b] Straight-time hours: 8 consecutive hours per day. 40 hours over 5 consecutive days, Monday through Sunday shall constitute a week's work at straight time.

[c] The sixth consecutive day in the same work week may be worked at straight-time if job is shut down during work week due to inclement weather.

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm. Holiday provisions for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the travel and/or subsistence provisions for the current determinations on the Internet at http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm. Travel and/or subsistence requirements for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

CLASSIFICATION GROUPS:

Group 1
Protective coating, Pavement sealing (repairs and filling of cracks by any method to parking lots, game courts and playgrounds, and tracks, whether indoor or outdoor)
Truck Mounted Attenuator
Automatous Truck Mounted Attenuator
Installation of carstops
Traffic Control Person & Serviceman; including work of installing and protecting utility covers, traffic delineating devices, posting of no parking and notifications for public convenience
Asphalt Repair
Equipment Repair Technician
Truncated Dome Assitant
Decorative Asphalt Surfacing Applicator Assistant

Group 2
Traffic Surface Abrasive Blaster
Pot Tender
Traffic Control Person/Certified Traffic Control Person
Repairing and filling of cracks and surface cleaning on streets, highways, and airports by any means, and other work not directly connected with the application of slurry seal
Slurry Seal Squeegeeman (finisher)
Bob Cat/Skid Steer
Seal Roller
Forklift

Group 3
Traffic Delineating Device Applicator
Traffic Protective System Installer
Pavement Marking Applicator
Slurry Seal Applicator Operator (Line Driver-including self-contained distribution units, aggregate spreader truck)
Shuttleman (loader/slurry machine operations) operation of all related machinery and equipment; handling of related materials
Truncated Dome Technician
Decorative Asphalt Surfacing Applicator

Group 4
Traffic Striping Applicator
Slurry Seal Mixer Operator
Power Broom Sweeper (operation of all related trucks, machinery and equipment; Handling of related materials)

GENERAL PREVAILING WAGE APPRENTICE RATES

APPRENTICE INFORMATION

Determination: **2020--2** *Issue Date:* **08-22-2020** *Expire Date:* **06-30-2021** ** *Page:* **1**

Craft/Classification: **Parking and Highway Improvement (Striper-Laborer)** *Shift:* **1**

Counties: Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Ventura

Period	Duration Months	OJT Hours	Hourly Basic Rate	Health & Welfare	Pension	Vacation /Holiday	Training	Other	Hourly Total Rate
1		800	$24.870	$5.600	$2.520	$2.560	$.550		$36.100
2		1,000	$29.110	$5.600	$2.520	$2.560	$.550		$40.340
3		1,000	$31.780	$6.400	$3.050	$3.580	$1.320	$.440	$46.570
4		1,000	$33.900	$6.400	$3.050	$3.580	$1.320	$.440	$48.690

Footnote(s):

Apprentice Wage & Benefit Rates are calculated based on Group 3 Journeyman rates.

Vacation/Holiday - Includes amount for supplemental dues

Other - Includes amount for Center for Contract Compliance, Industry Fund, and Contract Administration Fund.

JOURNEYMAN PREDETERMINED INCREASES:
Effective 7/1/2021, there will be an increase of $2.15 to be allocated to wages and or employer payments.

There may be corresponding predetermined increase(s) to the apprentices associated with this journeyman craft/classification. Please fax a request to (415) 703-4771 or send to the following address:

Department of Industrial Relations
Office of the Director - Research Unit
P.O. Box 420603
San Francisco, CA 94142-0603

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STATE OF CALIFORNIA Gavin Newsom, *Governor*

DEPARTMENT OF INDUSTRIAL RELATIONS
Office of the Director – Research Unit
455 Golden Gate Avenue, 9th Floor
San Francisco, CA 94102

MAILING ADDRESS:
P. O. Box 420603
San Francisco, CA 94142-0603

IMPORTANT NOTICE TO AWARDING BODIES & ALL INTERESTED PARTIES
REGARDING CHANGES TO THE DIRECTOR'S GENERAL PREVAILING WAGE DETERMINATIONS

INTERIM DETERMINATION FOR THE CRAFT OF
#TEAMSTER (APPLIES ONLY TO WORK ON THE CONSTRUCTION SITE)

DETERMINATION: SC-23-261-2-2020-2

ISSUE DATE: September 30, 2020

EXPIRATION DATE OF DETERMINATION: June 30, 2021** The rate to be paid for work performed after this date has been determined. If work will extend past this date, the new rate must be paid and should be incorporated in contracts entered into now. Contact the Office of the Director – Research Unit for specific rates at (415) 703-4774.

LOCALITY: All localities within Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara and Ventura Counties

This determination applies to projects advertised for bids on or after October 10, 2020. These rates supersede the Teamster wage rates issued in the following General Prevailing Wage Determination: SC-23-261-2-2020-1

			Employer Payments				Straight-Time		Overtime Hourly Rates		
Classification[c] (Journeyperson)	Basic Hourly Rate	Health and Welfare	Pension	Vacation/ Holiday	Training	Other Payments	Hours	Total Hourly Rate	Daily[d] 1 1/2X	Saturday[d] 1 1/2X	Sunday/ Holiday 2X
Group I	32.59	19.62	6.00	3.15[a]	1.82	0.45	8	63.63	79.93	79.93	96.22
Group II	32.74	19.62	6.00	3.15[a]	1.82	0.45	8	63.78	80.15	80.15	96.52
Group III	32.87	19.62	6.00	3.15[a]	1.82	0.45	8	63.91	80.35	80.35	96.78
Group IV	33.06	19.62	6.00	3.15[a]	1.82	0.45	8	64.10	80.63	80.63	97.16
Group V	33.09	19.62	6.00	3.15[a]	1.82	0.45	8	64.13	80.68	80.68	97.22
Group VI	33.12	19.62	6.00	3.15[a]	1.82	0.45	8	64.16	80.72	80.72	97.28
Group VII	33.37	19.62	6.00	3.15[a]	1.82	0.45	8	64.41	81.10	81.10	97.78
Group VIII	33.62	19.62	6.00	3.15[a]	1.82	0.45	8	64.66	81.47	81.47	98.28
Group IX	33.82	19.62	6.00	3.15[a]	1.82	0.45	8	64.86	81.77	81.77	98.68
Group X	34.12	19.62	6.00	3.15[a]	1.82	0.45	8	65.16	82.22	82.22	99.28
Group XI	34.62	19.62	6.00	3.15[a]	1.82	0.45	8	65.66	82.97	82.97	100.28
Subjourneyman[b]											
0-2000 hours	18.80	19.62	6.00	2.00[a]	1.82	0.45	8	48.69	58.09	58.09	67.49
2001-4000 hours	20.80	19.62	6.00	2.25[a]	1.82	0.45	8	50.94	61.34	61.34	71.74
4001-6000 hours	22.80	19.62	6.00	2.50[a]	1.82	0.45	8	53.19	64.59	64.59	75.99
Over 6000 hours and thereafter at journeyman rates											

# Indicates an apprenticeable craft. The current apprentice wage rates are available on the Internet @ http://www.dir.ca.gov/OPRL/PWAppWage/PWAppWageStart.asp . To obtain any apprentice wage rates as of July 1, 2008 and prior to September 27, 2012, please contact the Division of Apprenticeship Standards or refer to the Division of Apprenticeship Standards' website at http://www.dir.ca.gov/das/das.html.

[a] Includes an amount for Supplemental Dues.

[b] Subjourneyman may be employed at a ratio of one subjourneyman for every five journeymen.

[c] For classifications within each group, see page 21A.

[d] Rate applies to the first 4 daily overtime hours on weekdays and the first 12 hours on Saturday. All other overtime is paid at the Sunday/Holiday double-time rate.

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/oprl/DPreWageDetermination.htm. Holiday provisions for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the travel and/or subsistence provisions for the current determinations on the Internet at http://www.dir.ca.gov/oprl/DPreWageDetermination.htm. Travel and/or subsistence requirements for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

Group I
Warehouseman and Teamster

Group II
Driver of Vehicle or Combination of Vehicles - 2 axles
Traffic Control Pilot Car, excluding moving heavy equipment permit load
Truck Mounted Power Broom

Group III
Driver of Vehicle or Combination of Vehicles - 3 axles
Bootman
Cement Mason Distribution Truck
Fuel Truck Driver
Water Truck - 2 axles
Dump Truck of less than 16 yards water level
Erosion Control Driver

Group IV
Driver of Transit Mix Truck-Under 3 yds
Dumpcrete Truck Less than 6 1/2 yards water level
Truck Repairman Helper

Group V
Water Truck 3 or more axles
Warehouseman Clerk
Slurry Truck Driver

Group VI
Driver of Transit Mix Truck - 3 yds or more
Dumpcrete Truck 6 1/2 yds water level and over
Driver of Vehicle or Combination of Vehicles - 4 or more axles
Driver of Oil Spreader Truck
Dump Truck 16 yds to 25 yds water level
Side Dump Trucks
Flow Boy Dump Trucks

Group VII
A Frame, Swedish Crane or Similar
Forklift Driver
Ross Carrier Driver

Group VIII
Dump Truck of 25 yds to 49 yards water level
Truck Repairman
Water Pull Single Engine
Welder

Group IX
Truck Repairman Welder
Low Bed Driver, 9 axles or over

Group X
Working Truck Driver
Truck Greaser and Tireman - $0.50 additional for Tireman
Pipeline and Utility Working Truck Driver, including Winch Truck and Plastic Fusion, limited to Pipeline and Utility Work
Dump Truck and Articulating - 50 yards or more water level
Water Pull Single Engine with attachment

Group XI
Water Pull Twin Engine
Water Pull Twin Engine with attachments
Winch Truck Driver - $0.25 additional when operating a Winch or similar special attachments

IMPORTANT NOTICE TO AWARDING BODIES & ALL INTERESTED PARTIES
REGARDING CHANGES TO THE DIRECTOR'S GENERAL PREVAILING WAGE DETERMINATIONS

INTERIM DETERMINATION FOR THE CRAFT OF
#TEAMSTER (SPECIAL SHIFT) (APPLIES ONLY TO WORK ON THE CONSTRUCTION SITE)

DETERMINATION: SC-23-261-2-2020-2
ISSUE DATE: September 30, 2020
EXPIRATION DATE OF DETERMINATION: June 30, 2021** The rate to be paid for work performed after this date has been determined. If work will extend past this date, the new rate must be paid and should be incorporated in contracts entered into now. Contact the Office of the Director – Research Unit for specific rates at (415) 703-4774.
LOCALITY: All localities within Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara and Ventura Counties

This determination applies to projects advertised for bids on or after October 10, 2020. These rates supersede the Teamster (Special Shift) wage rates issued in the following General Prevailing Wage Determination: SC-23-261-2-2020-1

		Employer Payments					Straight-Time		Overtime Hourly Rates		
Classification[c] (Journeyperson)	Basic Hourly Rate	Health and Welfare	Pension	Vacation/ Holiday	Training	Other Payments	Hours	Total Hourly Rate	Daily[d] 1 1/2X	Saturday[d] 1 1/2X	Sunday/ Holiday 2X
Group I	33.09	19.62	6.00	3.15[a]	1.82	0.45	8	64.13	80.68	80.68	97.22
Group II	33.24	19.62	6.00	3.15[a]	1.82	0.45	8	64.28	80.90	80.90	97.52
Group III	33.37	19.62	6.00	3.15[a]	1.82	0.45	8	64.41	81.10	81.10	97.78
Group IV	33.56	19.62	6.00	3.15[a]	1.82	0.45	8	64.60	81.38	81.38	98.16
Group V	33.59	19.62	6.00	3.15[a]	1.82	0.45	8	64.63	81.43	81.43	98.22
Group VI	33.62	19.62	6.00	3.15[a]	1.82	0.45	8	64.66	81.47	81.47	98.28
Group VII	33.87	19.62	6.00	3.15[a]	1.82	0.45	8	64.91	81.85	81.85	98.78
Group VIII	34.12	19.62	6.00	3.15[a]	1.82	0.45	8	65.16	82.22	82.22	99.28
Group IX	34.32	19.62	6.00	3.15[a]	1.82	0.45	8	65.36	82.52	82.52	99.68
Group X	34.62	19.62	6.00	3.15[a]	1.82	0.45	8	65.66	82.97	82.97	100.28
Group XI	35.12	19.62	6.00	3.15[a]	1.82	0.45	8	66.16	83.72	83.72	101.28
Subjourneyman[b]											
0-2000 hours	18.80	19.62	6.00	2.00[a]	1.82	0.45	8	48.69	58.09	58.09	67.49
2001-4000 hours	20.80	19.62	6.00	2.25[a]	1.82	0.45	8	50.94	61.34	61.34	71.74
4001-6000 hours	22.80	19.62	6.00	2.50[a]	1.82	0.45	8	53.19	64.59	64.59	75.99
Over 6000 hours and thereafter at journeyman rates											

#Indicates an apprenticeable craft. The current apprentice wage rates are available on the Internet @ http://www.dir.ca.gov/OPRL/PWAppWage/PWAppWageStart.asp. To obtain any apprentice wage rates as of July 1, 2008 and prior to September 27, 2012, please contact the Division of Apprenticeship Standards or refer to the Division of Apprenticeship Standards' website at http://www.dir.ca.gov/das/das.html.

[a] Includes an amount for Supplemental Dues.

[b] Subjourneyman may be employed at a ratio of one subjourneyman for every five journeymen.

[c] For classifications within each group, see page 21A.

[d] Rate applies to the first 4 daily overtime hours and the first 12 hours on Saturday. All other overtime is paid at the Sunday/Holiday double-time rate.

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/oprl/DPreWageDetermination.htm. Holiday provisions for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the travel and/or subsistence provisions for the current determinations on the Internet at http://www.dir.ca.gov/oprl/DPreWageDetermination.htm. Travel and/or subsistence requirements for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

IMPORTANT NOTICE TO AWARDING BODIES & ALL INTERESTED PARTIES
REGARDING CHANGES TO THE DIRECTOR'S GENERAL PREVAILING WAGE DETERMINATIONS

INTERIM DETERMINATION FOR THE CRAFT OF #TEAMSTER (SECOND SHIFT) (APPLIES ONLY TO WORK ON THE CONSTRUCTION SITE)

DETERMINATION: SC-23-261-2-2020-2
ISSUE DATE: September 30, 2020
EXPIRATION DATE OF DETERMINATION: June 30, 2021** The rate to be paid for work performed after this date has been determined. If work will extend past this date, the new rate must be paid and should be incorporated in contracts entered into now. Contact the Office of the Director – Research Unit for specific rates at (415) 703-4774.
LOCALITY: All localities within Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara and Ventura Counties

This determination applies to projects advertised for bids on or after October 10, 2020. These rates supersede the Teamster (Second Shift) wage rates issued in the following General Prevailing Wage Determination: SC-23-261-2-2020-1

		Employer Payments					Straight-Time		Overtime Hourly Rates		
Classification[c] (Journeyperson)	Basic Hourly Rate	Health and Welfare	Pension	Vacation/ Holiday	Training	Other Payments	Hours[d]	Total Hourly Rate	Daily[e] 1 1/2X	Saturday[e] 1 1/2X	Sunday/ Holiday 2X
Group I	33.59	19.62	6.00	3.15[a]	1.82	0.45	8	64.63	81.43	81.43	98.22
Group II	33.74	19.62	6.00	3.15[a]	1.82	0.45	8	64.78	81.65	81.65	98.52
Group III	33.87	19.62	6.00	3.15[a]	1.82	0.45	8	64.91	81.85	81.85	98.78
Group IV	34.06	19.62	6.00	3.15[a]	1.82	0.45	8	65.10	82.13	82.13	99.16
Group V	34.09	19.62	6.00	3.15[a]	1.82	0.45	8	65.13	82.18	82.18	99.22
Group VI	34.12	19.62	6.00	3.15[a]	1.82	0.45	8	65.16	82.22	82.22	99.28
Group VII	34.37	19.62	6.00	3.15[a]	1.82	0.45	8	65.41	82.60	82.60	99.78
Group VIII	34.62	19.62	6.00	3.15[a]	1.82	0.45	8	65.66	82.97	82.97	100.28
Group IX	34.82	19.62	6.00	3.15[a]	1.82	0.45	8	65.86	83.27	83.27	100.68
Group X	35.12	19.62	6.00	3.15[a]	1.82	0.45	8	66.16	83.72	83.72	101.28
Group XI	35.62	19.62	6.00	3.15[a]	1.82	0.45	8	66.66	84.47	84.47	102.28
Subjourneyman[b]											
0-2000 hours	18.80	19.62	6.00	2.00[a]	1.82	0.45	8	48.69	58.09	58.09	67.49
2001-4000 hours	20.80	19.62	6.00	2.25[a]	1.82	0.45	8	50.94	61.34	61.34	71.74
4001-6000 hours	22.80	19.62	6.00	2.50[a]	1.82	0.45	8	53.19	64.59	64.59	75.99
Over 6000 hours and thereafter at journeyman rates											

#Indicates an apprenticeable craft. The current apprentice wage rates are available on the Internet @ http://www.dir.ca.gov/OPRL/PWAppWage/PWAppWageStart.asp. To obtain any apprentice wage rates as of July 1, 2008 and prior to September 27, 2012, please contact the Division of Apprenticeship Standards or refer to the Division of Apprenticeship Standards' website at http://www.dir.ca.gov/das/das.html.

[a] Includes an amount for Supplemental Dues.

[b] Subjourneyman may be employed at a ratio of one subjourneyman for every five journeymen.

[c] For classifications within each group, see page 21A.

[d] The third shift shall work 6.5 hours, exclusive of meal period, for which 8 hours straight-time shall be paid at the non-shift rate, Monday through Friday.

[e] Rate applies to the first 4 daily overtime hours and the first 12 hours on Saturday. All other overtime is paid at the Sunday/Holiday double-time rate.

RECOGNIZED HOLIDAYS: Holidays upon which the general prevailing hourly wage rate for Holiday work shall be paid, shall be all holidays in the collective bargaining agreement, applicable to the particular craft, classification, or type of worker employed on the project, which is on file with the Director of Industrial Relations. If the prevailing rate is not based on a collectively bargained rate, the holidays upon which the prevailing rate shall be paid shall be as provided in Section 6700 of the Government Code. You may obtain the holiday provisions for the current determinations on the Internet at http://www.dir.ca.gov/oprl/DPreWageDetermination.htm. Holiday provisions for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: In accordance with Labor Code Sections 1773.1 and 1773.9, contractors shall make travel and/or subsistence payments to each worker to execute the work. You may obtain the travel and/or subsistence provisions for the current determinations on the Internet at http://www.dir.ca.gov/oprl/DPreWageDetermination.htm. Travel and/or subsistence requirements for current or superseded determinations may be obtained by contacting the Office of the Director – Research Unit at (415) 703-4774.

GENERAL PREVAILING WAGE APPRENTICE RATES

APPRENTICE INFORMATION

Determination: **2020--2** *Issue Date:* **09-30-2020** *Expire Date:* **06-30-2021** ****** *Page:* **1**

Craft/Classification: **Teamster**

INTERIM DETERMINATION EFFECTIVE 10/10/2020

Counties: Imperial, Inyo, Kern, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara, Ventura

Period	Duration Months	OJT Hours	Hourly Basic Rate	Health & Welfare	Pension	Vacation /Holiday	Training	Other	Hourly Total Rate
1		600	$18.080	$14.560	$2.000	$1.450	$1.820	$.450	$38.360
2		600	$20.470	$14.560	$2.000	$1.450	$1.820	$.450	$40.750
3		600	$23.200	$14.560	$2.000	$1.450	$1.820	$.450	$43.480
4		600	$25.590	$14.560	$2.000	$1.450	$1.820	$.450	$45.870
5		600	$29.000	$14.560	$2.000	$1.450	$1.820	$.450	$49.280
6		600	$32.410	$14.560	$2.000	$1.450	$1.820	$.450	$52.690

Footnote(s):

Vacation & Holiday - Includes Amount for Supplemental Dues.

Apprentice rates based on Group X Journeyman Rates.

** Journeyman Predetermined Increases:
7/1/2021: $2.00 to be allocated to wages and/or employer payments.

There may be corresponding predetermined increase(s) to the apprentices associated with this journeyman craft/classification. Please fax a request to (415) 703-4771 or send to the following address:

Department of Industrial Relations
Office of the Director - Research Unit
P.O. Box 420603
San Francisco, CA 94142-0603

Apprentice Prevailing Wage Rates are paid only to apprentices registered with the State of California, Division of Apprenticeship Standards, for work the registered apprentice performs in his/her specific craft or trade. You may check whether an Apprentices is registered at http://www.dir.ca.gov/DAS/appcertpw/AppCertSearch.asp

GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS

PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.4

FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

LOCALITY: VENTURA COUNTY

DETERMINATION: VEN-2020-2

		CRAFT (JOURNEY LEVEL)	ISSUE DATE	EXPIRATION DATE	EMPLOYER PAYMENTS					STRAIGHT-TIME		OVERTIME HOURLY RATE		
					BASIC HOURLY RATE	HEALTH AND WELFARE	PENSION	VACATION/ HOLIDAY	TRAINING	OTHER PAYMENTS	HOURS	TOTAL HOURLY RATE	DAILY	SATURDAY	SUNDAY AND HOLIDAY
#		**BRICKLAYER, STONEMASON,** CEMENT BLOCKLAYER, POINTER, CAULKER, CLEANER	8/22/2020	04/30/2021*	A 41.390	9.250	8.550	-	B 1.010	0.850	C 8.0	61.050	D 81.750	D 81.750	102.440
#		**BRICKLAYER:**													
		MASON FINISHER	8/22/2020	04/30/2021*	A 29.070	9.250	9.210	-	B 0.890	0.450	C 8.0	48.870	D 63.400	D 63.400	77.940
#	E	**BRICK TENDER**	8/22/2020	06/30/2021*	34.000	8.000	8.400	F 4.400	0.700	0.450	C 8.0	55.950	72.950	72.950	89.950
		FORKLIFT OPERATOR	8/22/2020	06/30/2021*	34.450	8.000	8.400	F 4.400	0.700	0.450	C 8.0	56.400	73.630	73.630	90.850
#		**CARPET, LINOLEUM,**													
		RESILIENT TILE LAYER	8/22/2020	12/31/2020**	G 37.550	5.480	5.550	2.120	0.630	0.280	8.0	51.610	70.390	H 70.390	89.160
	I	MATERIAL HANDLER	8/22/2020	12/31/2020**	G 13.000	5.480	1.940	0.620	0.630	0.280	8.0	21.950	28.450	J 28.450	34.950
#		**DRYWALL FINISHER**													
		DRYWALL FINISHER	8/22/2020	09/30/2020**	G 42.180	8.850	6.880	3.070	0.720	0.870	8.0	62.570	83.660	K 83.660	104.750
#		**ELECTRICIAN:**													
		SOUND INSTALLER	2/22/2020	12/27/2020**	36.970	8.560	L 4.370	-	0.650	M 0.250	8.0	51.910	N 70.950	N 70.950	89.990
	O	INSIDE WIREMAN	8/22/2020	09/30/2020*	P 42.000	8.960	Q 16.640	R -	1.000	0.970	8.0	70.830	S 100.780	S 100.780	130.730
	O	CABLE SPLICER	8/22/2020	09/30/2020*	P 46.200	8.960	Q 16.640	R -	1.000	1.010	8.0	75.200	S 107.310	S 107.310	139.420
	O	TRANSPORTATION SYSTEMS WIREMAN	8/22/2020	09/30/2020*	P 42.000	8.960	Q 16.640	R -	1.000	0.970	8.0	70.830	S 100.780	S 100.780	130.730
	O	TRANSPORTATION SYSTEMS TECHNICIAN	8/22/2020	09/30/2020*	P 31.500	8.960	Q 16.640	R -	1.000	0.870	8.0	59.920	S 84.460	S 84.460	109.000
#		**FIELD SURVEYOR:**													
	T	CHIEF OF PARTY (018.167-010)	2/22/2020	09/30/2020**	52.060	11.600	11.150	F 4.770	1.150	0.150	8.0	80.880	N 106.910	N 106.910	132.940
	T	INSTRUMENTMAN (018.167-034)	2/22/2020	09/30/2020**	49.260	11.600	11.150	F 4.600	1.150	0.150	8.0	77.910	N 102.540	N 102.540	127.170
	T	CHAINMAN/RODMAN (869.567-010)	2/22/2020	09/30/2020**	48.680	11.600	11.150	F 4.550	1.150	0.150	8.0	77.280	N 101.620	N 101.620	125.960
#		**GLAZIER**	8/22/2020	05/31/2021**	U 47.950	V 7.750	13.450	W -	0.770	0.930	8.0	70.850	X 93.330	X 93.330	115.800
#		**MARBLE FINISHER**	8/22/2020	05/31/2021**	Y 34.690	9.000	4.270	-	0.830	0.320	8.0	49.110	Z 66.450	AA 66.450	AB 83.800
#		**PAINTER:**													
	AC	PAINTER, LEAD ABATEMENT REPAINT PAINTER, LEAD	8/22/2020	06/30/2021*	P 31.040	9.000	4.940	2.490	0.750	1.010	8.0	49.230	AD 64.750	AD 64.750	AD 64.750
	AC	ABATEMENT	8/22/2020	06/30/2021*	P 26.400	9.000	4.940	2.330	0.750	1.010	8.0	44.430	AE 57.630	AE 57.630	AE 57.630
	AC	INDUSTRIAL PAINTER	8/22/2020	06/30/2021*	P 35.520	9.000	4.940	2.850	0.850	1.010	8.0	54.170	AD 71.930	AD 71.930	AD 71.930
	AC	INDUSTRIAL REPAINT PAINTER	8/22/2020	06/30/2021*	P 31.840	9.000	4.940	2.710	0.850	1.010	8.0	50.350	AE 66.270	AE 66.270	AE 66.270
	AF	GRAFFITI REMOVAL WORKER JOURNEYMAN (APPLIES ONLY TO PAINT-OVER METHOD)	2/22/2020	01/31/2021*	23.000	7.900	0.640	-	0.750	-	8.0	32.290	43.790	J 43.790	55.290
	AG	GRAFFITI REMOVAL WORKER 1 (APPLIES ONLY TO PAINT-OVER METHOD)	2/22/2020	01/31/2021*	16.000	7.900	0.640	-	0.750	-	8.0	25.290	33.290	J 33.290	41.290
	AH	GRAFFITI REMOVAL WORKER 2 (APPLIES ONLY TO PAINT-OVER METHOD)	2/22/2020	01/31/2021*	16.870	7.900	0.640	-	0.750	-	8.0	26.160	34.600	J 34.600	43.030
#		**PLASTERER**	8/22/2020	08/03/2021**	37.860	9.380	6.840	AI 6.890	0.990	1.040	AJ 8.0	63.000	AD 81.930	AK 81.930	100.860
#	AL	**PLASTER TENDER**	8/22/2020	08/03/2021**	38.580	8.000	8.710	AM 5.200	1.050	0.960	8.0	62.500	AN 81.790	AO 81.790	101.080
		PLASTER CLEAN-UP LABORER	8/22/2020	08/03/2021**	36.030	8.000	8.710	AM 5.200	1.050	0.960	8.0	59.950	AN 77.960	AO 77.960	95.980
#		**PLUMBER:**													
		PLUMBER, INDUSTRIAL AND GENERAL PIPEFITTER	8/22/2020	08/31/2021**	AP 52.280	8.910	AQ 13.300	AR -	2.500	AS 1.330	8.0	78.320	D 103.540	D 103.540	127.130
		SEWER AND STORM DRAIN PIPELAYER	8/22/2020	08/31/2021**	AP 39.390	8.800	AQ 10.450	AR -	2.230	AS 1.330	8.0	62.200	80.970	AT 80.970	99.130

GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS

PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.4

FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

LOCALITY: VENTURA COUNTY

DETERMINATION: VEN-2020-2

	CRAFT (JOURNEY LEVEL)	ISSUE DATE	EXPIRATION DATE	EMPLOYER PAYMENTS: BASIC HOURLY RATE	HEALTH AND WELFARE	PENSION	VACATION/ HOLIDAY	TRAINING	OTHER PAYMENTS	STRAIGHT-TIME: HOURS	TOTAL HOURLY RATE	OVERTIME HOURLY RATE: DAILY	SATURDAY	SUNDAY AND HOLIDAY
AU	SEWER AND STORM DRAIN PIPE TRADESMAN	8/22/2020	08/31/2021**	AV 19.500	9.050	0.380	-	1.360	AS 1.180	8.0	31.470	40.290	AT 40.290	49.120
	SERVICE AND REPAIR	8/22/2020	08/31/2021**	AP 50.700	8.910	AQ 12.990	AR -	1.830	AS 1.330	8.0	75.760	100.180	AW 100.180	AX 122.980
	LANDSCAPE/IRRIGATION FITTER	8/22/2020	08/31/2021**	Y 35.300	8.910	AQ 13.300	AR -	1.890	AS 1.130	AT 8.0	60.530	78.180	78.180	94.470
AY	LANDSCAPE/IRRIGATION TRADESMAN	8/22/2020	08/31/2021**	Y 15.360	3.000	AQ 1.160	-	0.100	AS 0.930	AT 8.0	20.550	28.230	28.230	35.910
	REFRIGERATION SERVICE HVACR	8/22/2020	08/29/2021**	G 45.130	9.060	AZ 6.850	R -	1.360	BA 0.830	8.0	63.230	85.790	BB 85.790	AB 106.030
	REFRIGERATION SERVICE TRADESMAN HVACR	8/22/2020	08/29/2021*	G 14.370	9.060	0.530	R -	0.730	BA 0.830	8.0	25.520	32.710	BB 32.710	AB 39.710
BC	FIRE SPRINKLER FITTER (PROTECTION AND CONTROL SYSTEMS, OVERHEAD AND UNDERGROUND)	8/22/2020	03/31/2021*	39.830	10.230	BD 14.960	-	0.520	0.250	8.0	65.790	85.710	85.710	105.620
BE	FIRE SPRINKLER FITTER (PROTECTION AND CONTROL SYSTEMS, OVERHEAD AND UNDERGROUND)	2/22/2020	08/31/2020*	46.510	10.230	16.800	R -	1.600	BF 0.300	8.0	75.440	BG 98.690	BG 98.690	121.950
#	**ROOFER**	8/22/2019	07/31/2020*	BH 39.520	8.560	BI 8.370	BJ -	0.510	BK 0.630	8.0	57.590	D 75.470	D 75.470	93.360
	PITCH WORK	8/22/2019	07/31/2020*	BH 41.270	8.560	BI 8.370	BJ -	0.510	BK 0.630	8.0	59.340	D 78.100	D 78.100	96.860
	PREPARER	8/22/2019	07/31/2020*	BH 40.520	8.560	BI 8.370	BJ -	0.510	BK 0.630	8.0	58.590	D 76.970	D 76.970	95.360
#	**SHEET METAL WORKER (HVAC)**	8/22/2020	07/31/2021**	G 46.870	10.600	BL 18.910	R -	1.640	1.320	AT 8.0	79.340	BM 102.780	BM 102.780	126.210
#	**TERRAZZO FINISHER**	8/22/2020	08/31/2021**	G 33.660	9.250	4.220	R -	0.730	0.260	AT 8.0	48.120	Z 64.950	BN 64.950	AB 81.780
#	**TERRAZZO WORKER**	8/22/2020	08/31/2021**	G 41.600	9.250	4.480	R -	1.000	0.260	AT 8.0	56.590	Z 77.390	BN 77.390	AB 98.190
#	**TILE FINISHER**	8/22/2020	05/31/2021**	Y 29.430	9.000	2.750	-	0.760	0.280	8.0	42.220	Z 56.940	AA 56.940	AB 71.650
#	**TILE LAYER**	8/22/2020	05/31/2021**	Y 41.740	9.000	8.220	-	0.940	0.370	8.0	60.270	Z 81.140	AA 81.140	AB 102.010

GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS
PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

LOCALITY: VENTURA COUNTY
DETERMINATION: VEN-2020-2

*	EFFECTIVE UNTIL SUPERSEDED BY A NEW DETERMINATION ISSUED BY THE DIRECTOR OF INDUSTRIAL RELATIONS. CONTACT THE OFFICE OF THE DIRECTOR – RESEARCH UNIT AT (415) 703-4774 FOR THE NEW RATES AFTER TEN DAYS AFTER THE EXPIRATION DATE IF NO SUBSEQUENT DETERMINATION IS ISSUED.
**	THE RATE TO BE PAID FOR WORK PERFORMED AFTER THIS DATE HAS BEEN DETERMINED. IF WORK WILL EXTEND PAST THIS DATE, THE NEW RATE MUST BE PAID AND SHOULD BE INCORPORATED IN CONTRACTS ENTERED INTO NOW. CONTACT THE OFFICE OF THE DIRECTOR – RESEARCH UNIT FOR SPECIFIC RATES AT (415) 703-4774.
#	INDICATES AN APPRENTICEABLE CRAFT. THE CURRENT APPRENTICE WAGE RATES ARE AVAILABLE ON THE INTERNET @ HTTPS://WWW.DIR.CA.GOV/OPRL/PWAPPWAGE/PWAPPWAGESTART.ASP.
&	THE BASIC HOURLY RATE AND EMPLOYER PAYMENTS ARE NOT TAKEN FROM A COLLECTIVE BARGAINING AGREEMENT FOR THIS CRAFT OR CLASSIFICATION.
A	INCLUDES AMOUNT WITHHELD FOR DUES CHECK OFF AND CONTRACT COMPLIANCE.
B	INCLUDES AN AMOUNT FOR IMI TRAINING FUND.
C	SATURDAYS IN THE SAME WORK WEEK MAY BE WORKED AT STRAIGHT-TIME IF JOB IS SHUT DOWN DURING THE NORMAL WORKWEEK DUE TO INCLEMENT WEATHER, OR REASONS BEYOND THE CONTROL OF THE EMPLOYER.
D	RATE APPLIES TO THE FIRST 2 DAILY OVERTIME HOURS AND THE FIRST 10 HOURS ON SATURDAY; ALL OTHER TIME IS PAID AT THE SUNDAY AND HOLIDAY OVERTIME HOURLY RATE.
E	THE RATIO OF BRICK TENDERS TO BRICKLAYERS SHALL BE AS FOLLOWS: ONE (1) BRICK TENDER TO NO MORE THAN THREE (3) BRICKLAYERS DURING THE INSTALLATION OF BLOCK ON A TYPICAL MASONRY PROJECT.
F	INCLUDES AN AMOUNT PER HOUR WORKED FOR SUPPLEMENTAL DUES.
G	INCLUDES AMOUNT WITHHELD FOR DUES CHECK OFF.
H	RATE APPLIES TO THE FIRST 12 HOURS WORKED ON SATURDAY, ALL OTHER TIME IS PAID AT DOUBLE TIME. SATURDAY MAY BE WORKED AT THE STRAIGHT-TIME HOURLY RATE FOR THE FIRST 8 HOURS IF INCLEMENT WEATHER FORCES A SYNTHETIC/ARTIFICIAL TURF PROJECT TO SHUT DOWN DURING THE REGULAR WORK WEEK (MONDAY THOUGH FRIDAY).
I	A MATERIAL HANDLER MAY BE UTILIZED IN RATIO OF ONE (1) MATERIAL HANDLER WITH ANY FIVE (5) JOURNEYMEN ON ANY GIVEN PROJECT.
J	RATE APPLIES TO THE FIRST 12 HOURS ON SATURDAY, ALL OTHER TIME IS PAID AT DOUBLE TIME.
K	RATE APPLIES TO FIRST 8 HOURS ONLY. DOUBLE TIME THEREAFTER. SATURDAYS IN THE SAME WORK WEEK MAY BE WORKED AT STRAIGHT-TIME IF JOB IS SHUT DOWN DURING THE NORMAL WORK WEEK DUE TO INCLEMENT WEATHER.
L	IN ADDITION, AN AMOUNT EQUAL TO 3% OF THE BASIC HOURLY RATE IS ADDED TO THE TOTAL HOURLY RATE AND OVERTIME HOURLY RATES FOR THE NATIONAL EMPLOYEES BENEFIT BOARD.
M	INCLUDES AN AMOUNT FOR THE NATIONAL LABOR-MANAGEMENT COOPERATION FUND AND THE ADMINISTRATIVE MAINTENANCE FUND.
N	RATE APPLIES TO THE FIRST 4 DAILY OVERTIME HOURS AND THE FIRST 12 HOURS WORKED ON SATURDAY; ALL OTHER TIME IS PAID AT THE SUNDAY AND HOLIDAY OVERTIME HOURLY RATE.
O	ZONE 2 CONSISTS OF ALL AREAS OUTSIDE OF 32 ROAD MILES FROM THE CITIES OF CAMARILLO, OXNARD, SANTA PAULA, VENTURA AND OAK VIEW. ALL WORKERS PERFORMING WORK IN ZONE 2 SHALL RECEIVE $5.00 PER HOUR ABOVE THE ZONE 1 BASIC HOURLY RATE. RATES FOR ELECTRICAL WORKERS WORKING IN COMPRESSED AIR AS WELL AS THEIR SUPPORT CLASSIFICATIONS ARE AVAILABLE BY REQUEST. PLEASE CONTACT THE OFFICE OF THE DIRECTOR - RESEARCH UNIT AT (415) 703-4774.
P	INCLUDES AMOUNT WITHHELD FOR WORKING DUES.
Q	PENSION IS FACTORED AT THE APPLICABLE OVERTIME MULTIPLIER. IN ADDITION, AN AMOUNT EQUAL TO 3% OF THE BASIC HOURLY RATE IS ADDED TO THE TOTAL HOURLY RATE AND OVERTIME HOURLY RATES FOR THE NATIONAL EMPLOYEES BENEFIT BOARD AND IS FACTORED AT THE APPLICABLE OVERTIME MULTIPLIER. PURSUANT TO LABOR CODE SECTIONS 1773.1 AND 1773.8, THE AMOUNT PAID FOR THIS EMPLOYER PAYMENT MAY VARY RESULTING IN A LOWER TAXABLE BASIC HOURLY WAGE RATE, BUT THE TOTAL HOURLY RATES FOR STRAIGHT TIME AND OVERTIME MAY NOT BE LESS THAN THE GENERAL PREVAILING RATE OF PER DIEM WAGES.
R	INCLUDED IN STRAIGHT-TIME HOURLY RATE.
S	RATE APPLIES TO THE FIRST 4 DAILY OT HOURS AND THE FIRST 12 OT HOURS ON SATURDAY. ALL OTHER OT IS PAID AT 2X.
T	DICTIONARY OF OCCUPATIONAL TITLES, FOURTH EDITION, 1977, U.S. DEPARTMENT OF LABOR.
U	INCLUDES AMOUNT WITHHELD FOR DUES CHECKOFF, WHICH IS FACTORED IN THE OVERTIME RATES. INCLUDES $3.00 FOR VACATION THAT IS NOT FACTORED IN THE OVERTIME RATES.
V	INCLUDES AN AMOUNT PER HOUR WORKED OR PAID TO DISABILITY FUND.
W	INCLUDED IN STRAIGHT-TIME HOURLY RATE WHICH IS NOT FACTORED IN THE OVERTIME RATES.
X	RATE APPLIES TO THE FIRST 2 OVERTIME HOURS MONDAY THROUGH FRIDAY AND THE FIRST 8 HOURS WORKED ON SATURDAY. ALL OTHER TIME IS PAID AT THE SUNDAY AND HOLIDAY OVERTIME RATE.
Y	INCLUDES AMOUNT WITHHELD FOR ADMINISTRATIVE DUES.
Z	RATE APPLIES TO FIRST TWO DAILY OVERTIME HOURS WORKED; ALL OTHER OVERTIME IS PAID AT THE HOLIDAY OVERTIME HOURLY RATE.
AA	RATE APPLIES TO THE FIRST 8 HOURS WORKED ON A SIXTH OR SEVENTH CONSECUTIVE DAY DURING ANY ONE CALENDAR WEEK UP TO 50 HOURS IN ANY ONE CALENDAR WEEK. ALL HOURS IN EXCESS OF 10 HOURS DAILY OR 50 HOURS WEEKLY ARE PAID AT THE HOLIDAY RATE. SATURDAYS IN THE SAME WORK WEEK MAY BE WORKED AT STRAIGHT-TIME IF JOB IS SHUT DOWN DURING THE NORMAL WORKWEEK DUE TO INCLEMENT WEATHER.
AB	RATE APPLIES TO WORK ON HOLIDAYS ONLY; SUNDAYS ARE PAID AT THE SATURDAY OVERTIME HOURLY RATE.
AC	AN ADDITIONAL $0.25 PER HOUR WILL BE ADDED TO THE BASIC HOURLY RATE WHEN PERFORMING PAPERHANGING WORK.
AD	DOUBLE TIME SHALL BE PAID FOR ALL HOURS WORKED OVER 12 HOURS IN ANY ONE DAY.

LOCALITY: VENTURA COUNTY

DETERMINATION: VEN-2020-2

AE ON REPAINT WAGE WORK ANY 8 HOURS IN A 24 HOUR PERIOD MONDAY THROUGH SUNDAY SHALL BE THE WORK DAY AND ANY 40 HOURS IN A WEEK SHALL BE THE WORK WEEK, PROVIDED THAT THE 40 HOURS IS WORKED IN 5 CONSECUTIVE DAYS (LEGAL HOLIDAYS WILL NOT BE COUNTED IN THE 5 CONSECUTIVE DAYS). FOR ALL WORK UNDER THIS CRAFT/CLASSIFICATION DOUBLE TIME SHALL BE PAID FOR ALL HOURS WORKED OVER 12 HOURS IN ANY ONE DAY.

AF RATE APPLIES AFTER 36 MONTHS OF EXPERIENCE

AG RATE APPLIES TO FIRST 12 MONTHS OF EXPERIENCE

AH RATE APPLIES AFTER 12 MONTHS THROUGH 36 MONTHS EXPERIENCE

AI INCLUDES AN AMOUNT PER HOUR WORKED OR PAID FOR DUES CHECK OFF

AJ SATURDAY IN THE SAME WORKWEEK MAY BE WORKED AT THE STRAIGHT-TIME HOURLY RATE IF IT IS NOT POSSIBLE TO COMPLETE FORTY HOURS OF WORK MONDAY THROUGH FRIDAY WHEN THE JOB IS SHUT DOWN DUE TO INCLEMENT WEATHER OR SIMILAR ACT OF GOD, OR BEYOND THE CONTRACTOR'S CONTROL.

AK RATE APPLIES TO THE FIRST 8 HOURS WORKED; ALL OTHER TIME IS PAID AT THE SUNDAY AND HOLIDAY OVERTIME HOURLY RATE.

AL THE RATIO OF PLASTER TENDERS TO PLASTERERS SHALL BE AS FOLLOWS: THERE SHALL BE A PLASTER TENDER ON THE JOBSITE WHENEVER THERE IS A PLASTERER PERFORMING WORK ON THE JOBSITE, EXCEPT ON SMALL PATCH WORK WHERE ONLY ONE PLASTERER IS PERFORMING WORK. FOR INSIDE BROWN COATINGS THERE SHALL BE 2 PLASTER TENDERS FOR UP TO EVERY 3 PLASTERERS. FOR INSIDE FINISH COATINGS THERE SHALL BE 1 PLASTER TENDER FOR UP TO EVERY 3 PLASTERERS. ON OUTSIDE FINISH AND BROWN COATINGS AND FOR ALL OTHER WORK, THERE SHALL BE 1 PLASTER TENDER FOR UP TO EVERY 2 PLASTERERS.

AM INCLUDES AN AMOUNT PER HOUR WORKED OR PAID FOR SUPPLEMENTAL DUES.

AN ALL WORK PERFORMED AFTER TWELVE (12) HOURS IN A DAY SHALL BE PAID AT THE SUNDAY/HOLIDAY RATE.

AO RATE APPLIES TO THE FIRST EIGHT HOURS ON SATURDAY. ALL OTHER TIME IS PAID AT THE SUNDAY AND HOLIDAY OVERTIME RATE. SATURDAY WORK MAY BE PAID AT THE STRAIGHT TIME RATE IF THE JOB IS SHUT DOWN DURING THE NORMAL WORK WEEK DUE TO INCLEMENT WEATHER.

AP INCLUDES AN AMOUNT WITHHELD FOR ADMINISTRATIVE DUES WHICH IS NOT FACTORED INTO OVERTIME AND AN AMOUNT FOR VACATION WHICH IS FACTORED AT 1.5 TIMES FOR ALL OVERTIME.

AQ INCLUDES AMOUNT FOR NATIONAL PENSION AND RETIREE'S X-MAS FUND.

AR AMOUNT INCLUDED IN BASIC HOURLY RATE AND FACTORED AT 1.5 TIMES FOR ALL OVERTIME.

AS INCLUDES AN AMOUNT FOR THE P.I.P.E. LABOR MANAGEMENT COOPERATION COMMITTEE AND THE CONTRACTOR EDUCATION & DEVELOPMENT FUND.

AT SATURDAYS IN THE SAME WORK WEEK MAY BE WORKED AT STRAIGHT-TIME IF JOB IS SHUT DOWN DURING THE NORMAL WORKWEEK DUE TO INCLEMENT WEATHER.

AU PIPE TRADESMEN SHALL NOT BE PERMITTED ON ANY JOB WITHOUT A JOURNEYMAN.

AV INCLUDES AN AMOUNT WITHHELD FOR ADMINISTRATIVE DUES WHICH IS NOT FACTORED IN THE OVERTIME RATES.

AW SATURDAY MAY BE WORKED AT STRAIGHT-TIME RATE, PROVIDED THAT THE HOURS DO NOT EXCEED 8 HOURS PER DAY OR 40 HOURS PER WEEK.

AX DOUBLE TIME SHALL BE PAID FOR NEW YEAR'S DAY, EASTER SUNDAY, LABOR DAY, THANKSGIVING DAY, AND CHRISTMAS.

AY TRADESMEN SHALL ONLY BE USED IF THE FIRST WORKER ON THE JOB IS A LANDSCAPE/IRRIGATION FITTER, SECOND WORKER MUST BE A LANDSCAPE/IRRIGATION FITTER OR APPRENTICE LANDSCAPE/IRRIGATION FITTER. THE 3RD AND 4TH MAY BE A TRADESMAN. THE 5TH MUST BE A LANDSCAPE/IRRIGATION FITTER AND THEREAFTER TRADESMEN WILL BE REFERRED ON A 50-50 BASIS, TO JOURNEYMAN OR APPRENTICE.

AZ INCLUDES AN AMOUNT FOR 401A PLAN.

BA INCLUDES AN AMOUNT FOR THE P.I.P.E. LABOR MANAGEMENT COOPERATION COMMITTEE TRUST FUND AND FOR PROMOTION FUND.

BB SATURDAY MAY BE PAID AT STRAIGHT TIME IF THE WORK WEEK IS TUESDAY THROUGH SATURDAY.

BC RATE APPLIES TO REMAINDER OF COUNTY.

BD INCLUDES AN AMOUNT FOR SUPPLEMENTAL PENSION FUND.

BE RATE APPLIES TO VENTURA COUNTY EXCEPT FOR THE FOLLOWING CITIES OR COMMUNITIES: CASITAS SPRINGS, COLONIA, EL RIO, FARIA, FOSTER PARK, HOLLYWOOD BEACH, LA CONCHITA, LIVE OAK ACRES, LOCKWOOD VALLEY, MEINERS OAKS, MIRAMONTE, MONTALVO, OAK VIEW, OJAI, OXNARD, PIERPONT BAY, SAN BUENAVENTURA, SATICOY, SEACLIFF, SOLIMAR BEACH, SUMMIT, VENTURA AND WHEELER SPRINGS.

BF AMOUNT IS FOR INDUSTRY PROMOTION FUND AND P.I.P.E. FUND.

BG RATE APPLIES TO THE FIRST 4 DAILY OVERTIME HOURS AND THE FIRST 10 HOURS ON SATURDAY; ALL OTHER TIME IS PAID AT THE SUNDAY AND HOLIDAY OVERTIME HOURLY RATE.

BH INCLUDE AMOUNTS FOR DUES CHECK OFF AND VACATION/HOLIDAY, WHICH ARE NOT FACTORED INTO OVERTIME.

BI INCLUDES AN AMOUNT PER HOUR WORKED FOR ANNUITY TRUST FUND.

BJ INCLUDED IN BASIC HOURLY RATE. VACATION IS NOT FACTORED INTO OVERTIME.

BK INCLUDE AMOUNTS FOR ADMINISTRATIVE FUND, COMPLIANCE FUND, INDUSTRY FUND, AND RESEARCH AND EDUCATION TRUST FUND.

BL INCLUDES AN AMOUNT PER HOUR WORKED FOR COLA FUND.

BM RATE APPLIES TO THE FIRST 4 DAILY OVERTIME HOURS AND THE FIRST 8 HOURS WORKED ON SATURDAY. ALL OTHER TIME IS PAID AT THE SUNDAY AND HOLIDAY OVERTIME RATE.

BN RATE APPLIES TO THE FIRST 8 HOURS WORKED ON A SIXTH OR SEVENTH CONSECUTIVE DAY DURING ANY ONE CALENDAR WEEK UP TO 50 HOURS IN ANY ONE CALENDAR WEEK. ALL OTHER TIME IS PAID AT THE HOLIDAY RATE.

GENERAL PREVAILING WAGE DETERMINATION MADE AY THE DIRECTOR OF INDUSTRIAL RELATIONS

PURSUANT TO CALIFORNIA LAAOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

FOR COMMERCIAL AUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

LOCALITY: VENTURA COUNTY

DETERMINATION: VEN-2020-2

	CRAFT (JOURNEY LEVEL)	ISSUE DATE	EXPIRATION DATE	INCREASE 1			INCREASE 2			INCREASE 3			INCREASE 4			INCREASE 5			INCREASE 6			INCREASE 7			INCREASE 8		
				DATE OF NEXT CHANGE	AMOUNT OF INCREASE		DATE OF NEXT CHANGE	AMOUNT OF INCREASE		DATE OF NEXT CHANGE	AMOUNT OF INCREASE		DATE OF NEXT CHANGE	AMOUNT OF INCREASE		DATE OF NEXT CHANGE	AMOUNT OF INCREASE		DATE OF NEXT CHANGE	AMOUNT OF INCREASE		DATE OF NEXT CHANGE	AMOUNT OF INCREASE		DATE OF NEXT CHANGE	AMOUNT OF INCREASE	
	CARPET, LINOLEUM,																										
	RESILIENT TILE LAYER	8/22/2020	12/31/2020**	1/1/2021	$1.45	A	1/1/2022	$1.45	A																		
B	MATERIAL HANDLER	8/22/2020	12/31/2020**	1/1/2021	$1.25	C	1/1/2022	$1.25	C																		
	DRYWALL FINISHER																										
	DRYWALL FINISHER	8/22/2020	09/30/2020**	10/1/2020	$2.50	D	10/1/2021	$2.50	E																		
	ELECTRICIAN:																										
	SOUND INSTALLER	2/22/2020	12/27/2020**	12/28/2020	$2.85	E	12/27/2021	$3.05	E																		
	FIELD SURVEYOR:																										
F	CHIEF OF PARTY (018.167-010)	2/22/2020	09/30/2020**	10/1/2020	$2.75	E	10/1/2021	$2.75	E																		
F	INSTRUMENTMAN (018.167-034)	2/22/2020	09/30/2020**	10/1/2020	$2.45	E	10/1/2021	$2.45	E																		
F	CHAINMAN/RODMAN (869.567-010)	2/22/2020	09/30/2020**	10/1/2020	$2.45	E	10/1/2021	$2.45	E																		
	GLAZIER	8/22/2020	05/31/2021**	6/1/2021	$3.03	G	6/1/2022	$4.02	H																		
	MARBLE FINISHER	8/22/2020	05/31/2021**	6/1/2021	$1.23	E																					
	PLASTERER	8/22/2020	08/03/2021**	8/4/2021	$2.20	E																					
I	**PLASTER TENDER**	8/22/2020	08/03/2021**	8/4/2021	$2.20	E																					
	PLASTER CLEAN-UP LABORER	8/22/2020	08/03/2021**	8/4/2021	$2.20	E																					
	PLUMBER:																										
	PLUMBER, INDUSTRIAL AND GENERAL PIPEFITTER	8/22/2020	08/31/2021**	9/1/2021	$2.26	E	9/1/2022	$2.26	E	9/1/2023	$2.35	E	9/1/2024	$2.50	E	9/1/2025	$2.50	E									
	SEWER AND STORM DRAIN PIPELAYER	8/22/2020	08/31/2021**	9/1/2021	$2.26	E	9/1/2022	$2.26	E	9/1/2023	$2.35	E	9/1/2024	$2.50	E	9/1/2025	$2.50	E									
J	SEWER AND STORM DRAIN PIPE TRADESMAN	8/22/2020	08/31/2021**	9/1/2021	$0.90	E	9/1/2022	$0.90	E	9/1/2023	$0.94	E	9/1/2024	$1.00	E	9/1/2025	$1.00	E									
	SERVICE AND REPAIR LANDSCAPE/IRRIGATION FITTER	8/22/2020	08/31/2021**	9/1/2021	$2.26	E	9/1/2022	$2.26	E	9/1/2023	$2.35	E	9/1/2024	$2.50	E	9/1/2025	$2.50	E									
K	LANDSCAPE/IRRIGATION TRADESMAN	8/22/2020	08/31/2021**	9/1/2021	$0.59	E	9/1/2022	$0.59	E	9/1/2023	$0.61	E	9/1/2024	$0.65	E	9/1/2025	$0.65	E									
	REFRIGERATION SERVICE HVACR	8/22/2020	08/29/2021**	8/30/2021	$2.15	E	9/5/2022	$2.15	E	9/4/2023	$2.15	E															
	SHEET METAL WORKER (HVAC)	8/22/2020	07/31/2021**	8/1/2021	$2.75	L	8/1/2022	$2.75	M																		
	TERRAZZO FINISHER	8/22/2020	08/31/2021**	9/1/2021	$1.68	E																					
	TERRAZZO WORKER	8/22/2020	08/31/2021**	9/1/2021	$1.98	E																					
	TILE FINISHER	8/22/2020	05/31/2021**	6/1/2021	$1.06	E																					
	TILE LAYER	8/22/2020	05/31/2021**	6/1/2021	$1.51	E																					

FOOTNOTES

GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS

PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

LOCALITY: VENTURA COUNTY

DETERMINATION: VEN-2020-2

A $1.20 TO THE BASIC HOURLY RATE, $0.15 TO HEALTH & WELFARE AND $0.10 TO VACATION/HOLIDAY.

B A MATERIAL HANDLER MAY BE UTILIZED IN RATIO OF ONE (1) MATERIAL HANDLER WITH ANY FIVE (5) JOURNEYMEN ON ANY GIVEN PROJECT.

C $1.00 TO THE BASIC HOURLY RATE, $0.15 TO HEALTH & WELFARE AND $0.10 TO VACATION/HOLIDAY.

D $1.00 TO THE BASIC HOURLY RATE, $0.25 TO PENSION, $1.00 TO VACATION, $0.15 TO TRAINING AND $0.10 TO OTHER.

E THE PREDETERMINED INCREASE SHOWN IS TO BE ALLOCATED TO WAGES AND/OR EMPLOYER PAYMENTS. PLEASE CONTACT THE OFFICE OF THE DIRECTOR - RESEARCH UNIT AT (415) 703-4774 WHEN THE PREDETERMINED INCREASE BECOMES DUE TO CONFIRM THE DISTRIBUTION. PLEASE ALSO EXAMINE THE IMPORTANT NOTICES TO SEE IF ANY MODIFICATIONS HAVE BEEN ISSUED, AS THERE MAY BE REDUCTIONS TO PREDETERMINED INCREASES.

F DICTIONARY OF OCCUPATIONAL TITLES, FOURTH EDITION, 1977, U.S. DEPARTMENT OF LABOR.

G $0.25 TO HEALTH & WELFARE, $0.40 TO PENSION, $0.03 TO OTHER AND $2.35 TO WAGES AND/OR FRINGES.

H $0.25 TO HEALTH & WELFARE, $1.00 TO PENSION, $0.02 TO OTHER AND $2.75 TO WAGES AND/OR FRINGES.

I THE RATIO OF PLASTER TENDERS TO PLASTERERS SHALL BE AS FOLLOWS: THERE SHALL BE A PLASTER TENDER ON THE JOBSITE WHENEVER THERE IS A PLASTERER PERFORMING WORK ON THE JOBSITE, EXCEPT ON SMALL PATCH WORK WHERE ONLY ONE PLASTERER IS PERFORMING WORK. FOR INSIDE BROWN COATINGS THERE SHALL BE 2 PLASTER TENDERS FOR UP TO EVERY 3 PLASTERERS. FOR INSIDE FINISH COATINGS THERE SHALL BE 1 PLASTER TENDER FOR UP TO EVERY 3 PLASTERERS. ON OUTSIDE FINISH AND BROWN COATINGS AND FOR ALL OTHER WORK, THERE SHALL BE 1 PLASTER TENDER FOR UP TO EVERY 2 PLASTERERS.

J PIPE TRADESMEN SHALL NOT BE PERMITTED ON ANY JOB WITHOUT A JOURNEYMAN.

K TRADESMEN SHALL ONLY BE USED IF THE FIRST WORKER ON THE JOB IS A LANDSCAPE/IRRIGATION FITTER, SECOND WORKER MUST BE A LANDSCAPE/IRRIGATION FITTER OR APPRENTICE LANDSCAPE/IRRIGATION FITTER. THE 3RD AND 4TH MAY BE A TRADESMAN. THE 5TH MUST BE A LANDSCAPE/IRRIGATION FITTER AND THEREAFTER TRADESMEN WILL BE REFERRED ON A 50-50 BASIS, TO JOURNEYMAN OR APPRENTICE.

L $0.05 TO TRAINING AND $2.70 TO WAGES AND/OR FRINGES.

M $0.01 TO OTHER AND $2.74 TO WAGES AND/OR FRINGES.

VEN-2020-2-INC

GENERAL PREVAILING WAGE APPRENTICE RATES

APPRENTICE INFORMATION

Determination: **2020--2** *Issue Date:* **08-22-2020** *Expire Date:* **09-30-2020** * *Page:* **1**

Craft/Classification: **Electrician, Inside Wireman** *Shift:* **1**

County: Ventura

Period	Duration Months	OJT Hours	Hourly Basic Rate	Health & Welfare	Pension	Vacation /Holiday	Training	Other	Hourly Total Rate
1		1,000	$16.800	$8.960	$.500		$1.000	$.170	$27.430
2		1,000	$18.900	$8.960	$.570		$1.000	$.190	$29.620
3		1,500	$21.000	$8.960	$17.270		$1.000	$.760	$48.990
4		1,500	$25.200	$8.960	$17.400		$1.000	$.800	$53.360
5		1,500	$29.400	$8.960	$17.520		$1.000	$.840	$57.720
6		1,500	$35.700	$8.960	$17.710		$1.000	$.910	$64.280

Footnote(s):

For Periods 2-6 BHR includes amount withheld for working dues.

Pension (No Pension for Period 1 + 2) - Includes an amount for pension and an amount equal to 3% of the Basic Hourly Rate for National Employees Benefit Board (NEBF). Both pension and NEBF are factored at the applicable overtime multiplier. Pursuant to Labor Code Sections 1773.1 and 1773.8, the amount paid for this employer payment may vary resulting in a lower taxable basic hourly wage rate, but the total hourly rates for straight time and overtime may not be less than the general prevailing rate of per diem wages.

Vacation (Periods 5-6) - Included in the Basic Hourly Rate

OTHER includes an amount for LMCC (No LMCC for Periods 1-2) and NEIF.

Note: Rates listed above are for ZONE A. (Zone B is defined as all work in excess of 32 road miles from nearest basing point. The basing point shall be the main post office in the following cities: Camarillo, Oxnard, Santa Paula, Ventura and Oak View.) All workers performing work in Zone B shall receive $5.00 per hour above the Zone A Basic Hourly Rate.

Apprentice Prevailing Wage Rates are paid only to apprentices registered with the State of California, Division of Apprenticeship Standards, for work the registered apprentice performs in his/her specific craft or trade. You may check whether an Apprentices is registered at http://www.dir.ca.gov/DAS/appcertpw/AppCertSearch.asp

GENERAL PREVAILING WAGE APPRENTICE RATES

APPRENTICE INFORMATION

Determination: **2020--2** *Issue Date:* **08-22-2020** *Expire Date:* **09-30-2020** * *Page:* **2**

Craft/Classification: **Electrician, Inside Wireman** *Shift:* **2**

County: Ventura

Period	Duration Months	OJT Hours	Hourly Basic Rate	Health & Welfare	Pension	Vacation /Holiday	Training	Other	Hourly Total Rate
1		1,000	$19.710	$8.960	$.590		$1.000	$.200	$30.460
2		1,000	$22.170	$8.960	$.670		$1.000	$.220	$33.020
3		1,500	$24.630	$8.960	$17.380		$1.000	$.800	$52.770
4		1,500	$29.560	$8.960	$17.530		$1.000	$.850	$57.900
5		1,500	$34.490	$8.960	$17.670		$1.000	$.890	$63.010
6		1,500	$41.880	$8.960	$17.900		$1.000	$.970	$70.710

Footnote(s):

For Periods 2-6 BHR includes amount withheld for working dues.

Pension (No Pension for Period 1 + 2) - Includes an amount for pension and an amount equal to 3% of the Basic Hourly Rate for National Employees Benefit Board (NEBF). Both pension and NEBF are factored at the applicable overtime multiplier. Pursuant to Labor Code Sections 1773.1 and 1773.8, the amount paid for this employer payment may vary resulting in a lower taxable basic hourly wage rate, but the total hourly rates for straight time and overtime may not be less than the general prevailing rate of per diem wages.

Vacation (Periods 5-6) - Included in the Basic Hourly Rate

OTHER includes an amount for LMCC (No LMCC for Periods 1-2) and NEIF.

Note: Rates listed above are for ZONE A. (Zone B is defined as all work in excess of 32 road miles from nearest basing point. The basing point shall be the main post office in the following cities: Camarillo, Oxnard, Santa Paula, Ventura and Oak View.) All workers performing work in Zone B shall receive $5.00 per hour above the Zone A Basic Hourly Rate.

Apprentice Prevailing Wage Rates are paid only to apprentices registered with the State of California, Division of Apprenticeship Standards, for work the registered apprentice performs in his/her specific craft or trade. You may check whether an Apprentices is registered at http://www.dir.ca.gov/DAS/appcertpw/AppCertSearch.asp

GENERAL PREVAILING WAGE APPRENTICE RATES

APPRENTICE INFORMATION

Determination: **2020--2** *Issue Date:* **08-22-2020** *Expire Date:* **09-30-2020** * *Page:* **3**

Craft/Classification: **Electrician, Inside Wireman** *Shift:* **3**

County: Ventura

Period	Duration Months	OJT Hours	Hourly Basic Rate	Health & Welfare	Pension	Vacation /Holiday	Training	Other	Hourly Total Rate
1		1,000	$22.080	$8.960	$.660		$1.000	$.220	$32.920
2		1,000	$24.830	$8.960	$.740		$1.000	$.250	$35.780
3		1,500	$27.590	$8.960	$17.470		$1.000	$.830	$55.850
4		1,500	$33.110	$8.960	$17.630		$1.000	$.880	$61.580
5		1,500	$38.630	$8.960	$17.800		$1.000	$.940	$67.330
6		1,500	$46.910	$8.960	$18.050		$1.000	$1.020	$75.940

Footnote(s):

For Periods 2-6 BHR includes amount withheld for working dues.

Pension (No Pension for Period 1 + 2) - Includes an amount for pension and an amount equal to 3% of the Basic Hourly Rate for National Employees Benefit Board (NEBF). Both pension and NEBF are factored at the applicable overtime multiplier. Pursuant to Labor Code Sections 1773.1 and 1773.8, the amount paid for this employer payment may vary resulting in a lower taxable basic hourly wage rate, but the total hourly rates for straight time and overtime may not be less than the general prevailing rate of per diem wages.

Vacation (Periods 5-6) - Included in the Basic Hourly Rate

OTHER includes an amount for LMCC (No LMCC for Periods 1-2) and NEIF.

Note: Rates listed above are for ZONE A. (Zone B is defined as all work in excess of 32 road miles from nearest basing point. The basing point shall be the main post office in the following cities: Camarillo, Oxnard, Santa Paula, Ventura and Oak View.) All workers performing work in Zone B shall receive $5.00 per hour above the Zone A Basic Hourly Rate.

Apprentice Prevailing Wage Rates are paid only to apprentices registered with the State of California, Division of Apprenticeship Standards, for work the registered apprentice performs in his/her specific craft or trade. You may check whether an Apprentices is registered at http://www.dir.ca.gov/DAS/appcertpw/AppCertSearch.asp

GENERAL PREVAILING WAGE APPRENTICE RATES

APPRENTICE INFORMATION

Determination: **2020--2** *Issue Date:* **02-22-2020** *Expire Date:* **09-30-2020** ** *Page:* **1**

Craft/Classification: **Chief of Party**

Counties: Imperial, Inyo, Kern, Kings, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Ventura

Period	Duration Months	OJT Hours	Hourly Basic Rate	Health & Welfare	Pension	Vacation /Holiday	Training	Other	Hourly Total Rate
1		4,000	$48.680	$11.600	$11.150	$4.770	$1.150	$.150	$77.500

Footnote(s):

There is only one (1) period of 4000 OJT hours for Chief of Party apprentices.

Vacation/Holiday - The amount of $1.40 is withheld for Supplemental Dues.
Other - Amount ($0.15) is for the Engineers Contract Compliance Committee.

JOURNEYMAN PREDETERMINED INCREASES:

Effective on 10/1/2020, there will be an increase of $2.75 to be allocated to wages and/or employer payments.
Effective on 10/1/2021, there will be an increase of $2.75 to be allocated to wages and/or employer payments.

There may be corresponding predetermined increase(s) to the apprentices associated with this journeyman craft/classification. Please fax a request to (415) 703-4771 or send to the following address:

Department of Industrial Relations
Office of the Director - Research Unit
P.O. Box 420603
San Francisco, CA 94142-0603

Apprentice Prevailing Wage Rates are paid only to apprentices registered with the State of California, Division of Apprenticeship Standards, for work the registered apprentice performs in his/her specific craft or trade. You may check whether an Apprentices is registered at http://www.dir.ca.gov/DAS/appcertpw/AppCertSearch.asp

GENERAL PREVAILING WAGE APPRENTICE RATES

APPRENTICE INFORMATION

Determination: **2020--2** *Issue Date:* **02-22-2020** *Expire Date:* **09-30-2020** ** *Page:* **1**

Craft/Classification: **Chainman/Rodman**

Counties: Imperial, Inyo, Kern, Kings, Los Angeles, Mono, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Ventura

Period	Duration Months	OJT Hours	Hourly Basic Rate	Health & Welfare	Pension	Vacation /Holiday	Training	Other	Hourly Total Rate
1		500	$20.450	$11.600	$1.500	$3.550	$1.150	$.150	$38.400
2		500	$23.850	$11.600	$1.500	$3.550	$1.150	$.150	$41.800
3		1,000	$27.260	$11.600	$11.150	$3.550	$1.150	$.150	$54.860
4		1,000	$30.670	$11.600	$11.150	$3.550	$1.150	$.150	$58.270
5		1,000	$33.590	$11.600	$11.150	$3.550	$1.150	$.150	$61.190
6		1,000	$36.510	$11.600	$11.150	$3.550	$1.150	$.150	$64.110
7		1,000	$38.940	$11.600	$11.150	$3.550	$1.150	$.150	$66.540

Footnote(s):

Pension - Includes an amount for Annuity.

Vacation/Holiday - The amount of $1.40 is withheld for Supplemental Dues.
Other - Amount ($0.15) is for the Engineers Contract Compliance Committee.

JOURNEYMAN PREDETERMINED INCREASES:

Effective on 10/1/2020, there will be an increase of $2.45 to be allocated to wages and/or employer payments.
Effective on 10/1/2021, there will be an increase of $2.45 to be allocated to wages and/or employer payments.

There may be corresponding predetermined increase(s) to the apprentices associated with this journeyman craft/classification. Please fax a request to (415) 703-4771 or send to the following address:

Department of Industrial Relations
Office of the Director - Research Unit
P.O. Box 420603
San Francisco, CA 94142-0603

Apprentice Prevailing Wage Rates are paid only to apprentices registered with the State of California, Division of Apprenticeship Standards, for work the registered apprentice performs in his/her specific craft or trade. You may check whether an Apprentices is registered at http://www.dir.ca.gov/DAS/appcertpw/AppCertSearch.asp

GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS

PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.4

FOR COMMERCIAL BUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

LOCALITY: VENTURA COUNTY

DETERMINATION: VEN-2020-2

	CRAFT (JOURNEY LEVEL)	ISSUE DATE	EXPIRATION DATE	BASIC HOURLY RATE	EMPLOYER PAYMENTS: HEALTH AND WELFARE	PENSION	VACATION/ HOLIDAY	TRAINING	OTHER PAYMENTS	STRAIGHT-TIME: HOURS	STRAIGHT-TIME: TOTAL HOURLY RATE	OVERTIME HOURLY RATE: DAILY	SATURDAY	SUNDAY AND HOLIDAY
#	**CARPET, LINOLEUM,**													
	RESILIENT TILE LAYER - SECOND SHIFT	8/22/2020	12/31/2020**	A 45.060	5.480	5.550	2.120	0.630	0.280	8.0	59.120	81.650	81.650	104.180
B	MATERIAL HANDLER - SECOND SHIFT	8/22/2020	12/31/2020**	A 15.600	5.480	1.940	0.620	0.630	0.280	8.0	24.550	32.350	32.350	40.150
#	**ELECTRICIAN:**													
	SOUND INSTALLER 2ND SHIFT	2/22/2020	12/27/2020**	43.370	8.560	C 4.370	-	0.650	D 0.250	8.0	58.500	E 80.840	F 80.840	G 103.170
	SOUND INSTALLER 3RD SHIFT	2/22/2020	12/27/2020**	48.580	8.560	C 4.370	-	0.650	D 0.250	8.0	63.870	E 88.890	F 88.890	G 113.900
H	INSIDE WIREMAN - ZONE A, 2ND SHIFT	8/22/2020	09/30/2020*	I 49.270	8.960	J 16.640	K -	1.000	1.040	8.0	78.390	L 112.080	L 112.080	G 145.780
H	CABLE SPLICER - ZONE A, 2ND SHIFT	8/22/2020	09/30/2020*	I 54.190	8.960	J 16.640	K -	1.000	1.090	8.0	83.510	L 119.730	L 119.730	G 155.960
H	TRANSPORTATION SYSTEMS WIREMAN - ZONE A, 2ND SHIFT	8/22/2020	09/30/2020*	I 49.270	8.960	J 16.640	K -	1.000	1.040	8.0	78.390	L 112.080	L 112.080	G 145.780
H	TRANSPORTATION SYSTEMS TECHNICIAN - ZONE A, 2ND SHIFT	8/22/2020	09/30/2020*	I 36.950	8.960	J 16.640	K -	1.000	0.920	8.0	65.580	L 92.930	L 92.930	G 120.280
H	INSIDE WIREMAN - ZONE A, 3RD SHIFT	8/22/2020	09/30/2020*	I 55.190	8.960	J 16.640	K -	1.000	1.100	8.0	84.550	L 121.290	L 121.290	G 158.030
H	CABLE SPLICER - ZONE A, 3RD SHIFT	8/22/2020	09/30/2020*	I 60.710	8.960	J 16.640	K -	1.000	1.160	8.0	90.290	L 129.880	L 129.880	G 169.460
H	TRANSPORTATION SYSTEMS WIREMAN - ZONE A, 3RD SHIFT	8/22/2020	09/30/2020*	I 55.190	8.960	J 16.640	K -	1.000	1.100	8.0	84.550	L 121.290	L 121.290	G 158.030
H	TRANSPORTATION SYSTEMS TECHNICIAN - ZONE A, 3RD SHIFT	8/22/2020	09/30/2020*	I 41.390	8.960	J 16.640	K -	1.000	0.960	8.0	70.190	L 99.830	L 99.830	G 129.460
#	**PLUMBER:**													
	PLUMBER, INDUSTRIAL AND GENERAL PIPEFITTER (2ND SHIFT)	8/22/2020	08/31/2021**	M 59.630	8.910	N 13.300	O -	2.500	P 1.330	8.0	85.670	Q 114.560	Q 114.560	141.830
	SEWER AND STORM DRAIN PIPELAYER (2ND SHIFT)	8/22/2020	08/31/2021**	M 45.120	8.800	N 10.450	O -	2.230	P 1.330	8.0	67.930	89.570	R 89.570	110.590
S	SEWER AND STORM DRAIN PIPE TRADESMAN (2ND SHIFT)	8/22/2020	08/31/2021**	T 22.430	9.050	0.380	-	1.360	P 1.180	8.0	34.400	44.690	R 44.690	54.980
	SERVICE AND REPAIR (2ND SHIFT)	8/22/2020	08/31/2021**	M 57.820	8.910	N 12.990	O -	1.830	P 1.330	8.0	82.880	110.870	U 110.870	V 137.230
	LANDSCAPE/IRRIGATION FITTER SECOND SHIFT	8/22/2020	08/31/2021**	W 40.190	8.910	N 13.300	O -	1.890	P 1.130	R 8.0	65.420	85.510	85.510	104.260
X	LANDSCAPE/IRRIGATION TRADESMAN SECOND SHIFT	8/22/2020	08/31/2021**	W 17.660	3.000	N 1.160	-	0.100	P 0.930	R 8.0	22.850	31.680	31.680	40.510
	REFRIGERATION SERVICE HVACR- 2ND SHIFT	8/22/2020	08/29/2021**	A 51.200	9.060	Y 6.850	K -	1.360	Z 0.830	8.0	69.300	94.900	AA 94.900	AB 118.170
AC	FIRE SPRINKLER FITTER (PROTECTION AND CONTROL SYSTEMS, OVERHEAD AND UNDERGROUND)- 2ND SHIFT	2/22/2020	08/31/2020*	53.490	10.230	16.800	K -	1.600	AD 0.300	8.0	82.420	AE 109.170	AE 109.170	135.910
#	SHEET METAL WORKER (HVAC):													
	SHEET METAL WORKER (SPECIAL SHIFT)	8/22/2020	07/31/2021**	A 51.560	10.600	AF 18.910	K -	1.640	1.320	R 8.0	84.030	AG 109.820	AG 109.820	135.590

FOOTNOTES

GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS
PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

LOCALITY: VENTURA COUNTY

DETERMINATION: VEN-2020-2

*	EFFECTIVE UNTIL SUPERSEDED BY A NEW DETERMINATION ISSUED BY THE DIRECTOR OF INDUSTRIAL RELATIONS. CONTACT THE OFFICE OF THE DIRECTOR – RESEARCH UNIT AT (415) 703-4774 FOR THE NEW RATES AFTER TEN DAYS AFTER THE EXPIRATION DATE IF NO SUBSEQUENT DETERMINATION IS ISSUED.
**	THE RATE TO BE PAID FOR WORK PERFORMED AFTER THIS DATE HAS BEEN DETERMINED. IF WORK WILL EXTEND PAST THIS DATE, THE NEW RATE MUST BE PAID AND SHOULD BE INCORPORATED IN CONTRACTS ENTERED INTO NOW. CONTACT THE OFFICE OF THE DIRECTOR – RESEARCH UNIT FOR SPECIFIC RATES AT (415) 703-4774.
#	INDICATES AN APPRENTICEABLE CRAFT. THE CURRENT APPRENTICE WAGE RATES ARE AVAILABLE ON THE INTERNET @ HTTPS://WWW.DIR.CA.GOV/OPRL/PWAPPWAGE/PWAPPWAGESTART.ASP.
&	THE BASIC HOURLY RATE AND EMPLOYER PAYMENTS ARE NOT TAKEN FROM A COLLECTIVE BARGAINING AGREEMENT FOR THIS CRAFT OR CLASSIFICATION.
A	INCLUDES AMOUNT WITHHELD FOR DUES CHECK OFF.
B	A MATERIAL HANDLER MAY BE UTILIZED IN RATIO OF ONE (1) MATERIAL HANDLER WITH ANY FIVE (5) JOURNEYMEN ON ANY GIVEN PROJECT.
C	IN ADDITION, AN AMOUNT EQUAL TO 3% OF THE BASIC HOURLY RATE IS ADDED TO THE TOTAL HOURLY RATE AND OVERTIME HOURLY RATES FOR THE NATIONAL EMPLOYEES BENEFIT BOARD.
D	INCLUDES AN AMOUNT FOR THE NATIONAL LABOR-MANAGEMENT COOPERATION FUND AND THE ADMINISTRATIVE MAINTENANCE FUND.
E	RATE APPLIES TO THE FIRST 4 DAILY OVERTIME HOURS; ALL OTHER TIME IS PAID AT THE SUNDAY AND HOLIDAY NON-SHIFT DIFFERENTIAL OVERTIME HOURLY RATE.
F	DISREGARD THIS RATE. FOR THE FIRST 12 HOURS OF WORK PERFORMED ON SATURDAY, USE THE SATURDAY NON-SHIFT DIFFERENTIAL RATE FOR THIS CLASSIFICATION AS PUBLISHED IN THE DIRECTOR'S GENERAL PREVAILING WAGE DETERMINATIONS.
G	DISREGARD THIS RATE. USE THE SUNDAY AND HOLIDAY NON-SHIFT DIFFERENTIAL RATE FOR THIS CLASSIFICATION AS PUBLISHED IN THE DIRECTOR'S GENERAL PREVAILING WAGE DETERMINATIONS.
H	ZONE 2 CONSISTS OF ALL AREAS OUTSIDE OF 32 ROAD MILES FROM THE CITIES OF CAMARILLO, OXNARD, SANTA PAULA, VENTURA AND OAK VIEW. ALL WORKERS PERFORMING WORK IN ZONE 2 SHALL RECEIVE $5.00 PER HOUR ABOVE THE ZONE 1 BASIC HOURLY RATE. RATES FOR ELECTRICAL WORKERS WORKING IN COMPRESSED AIR AS WELL AS THEIR SUPPORT CLASSIFICATIONS ARE AVAILABLE BY REQUEST. PLEASE CONTACT THE OFFICE OF THE DIRECTOR - RESEARCH UNIT AT (415) 703-4774.
I	INCLUDES AMOUNT WITHHELD FOR WORKING DUES.
J	PENSION IS FACTORED AT THE APPLICABLE OVERTIME MULTIPLIER. IN ADDITION, AN AMOUNT EQUAL TO 3% OF THE BASIC HOURLY RATE IS ADDED TO THE TOTAL HOURLY RATE AND OVERTIME HOURLY RATES FOR THE NATIONAL EMPLOYEES BENEFIT BOARD AND IS FACTORED AT THE APPLICABLE OVERTIME MULTIPLIER. PURSUANT TO LABOR CODE SECTIONS 1773.1 AND 1773.8, THE AMOUNT PAID FOR THIS EMPLOYER PAYMENT MAY VARY RESULTING IN A LOWER TAXABLE BASIC HOURLY WAGE RATE, BUT THE TOTAL HOURLY RATES FOR STRAIGHT TIME AND OVERTIME MAY NOT BE LESS THAN THE GENERAL PREVAILING RATE OF PER DIEM WAGES.
K	INCLUDED IN STRAIGHT-TIME HOURLY RATE.
L	RATE APPLIES TO THE FIRST 4 DAILY OVERTIME HOURS AND THE FIRST 12 HOURS WORKED ON SATURDAY; ALL OTHER TIME IS PAID AT THE SUNDAY AND HOLIDAY NON-SHIFT OVERTIME HOURLY RATE.
M	INCLUDES AN AMOUNT WITHHELD FOR ADMINISTRATIVE DUES WHICH IS NOT FACTORED INTO OVERTIME AND AN AMOUNT FOR VACATION WHICH IS FACTORED AT 1.5 TIMES FOR ALL OVERTIME.
N	INCLUDES AMOUNT FOR NATIONAL PENSION AND RETIREE'S X-MAS FUND.
O	AMOUNT INCLUDED IN BASIC HOURLY RATE AND FACTORED AT 1.5 TIMES FOR ALL OVERTIME.
P	INCLUDES AN AMOUNT FOR THE P.I.P.E. LABOR MANAGEMENT COOPERATION COMMITTEE AND THE CONTRACTOR EDUCATION & DEVELOPMENT FUND.
Q	RATE APPLIES TO THE FIRST 2 DAILY OVERTIME HOURS AND THE FIRST 10 HOURS ON SATURDAY; ALL OTHER TIME IS PAID AT THE SUNDAY AND HOLIDAY OVERTIME HOURLY RATE.
R	SATURDAYS IN THE SAME WORK WEEK MAY BE WORKED AT STRAIGHT-TIME IF JOB IS SHUT DOWN DURING THE NORMAL WORKWEEK DUE TO INCLEMENT WEATHER.
S	PIPE TRADESMEN SHALL NOT BE PERMITTED ON ANY JOB WITHOUT A JOURNEYMAN.
T	INCLUDES AN AMOUNT WITHHELD FOR ADMINISTRATIVE DUES WHICH IS NOT FACTORED IN THE OVERTIME RATES.
U	SATURDAY MAY BE WORKED AT STRAIGHT-TIME RATE, PROVIDED THAT THE HOURS DO NOT EXCEED 8 HOURS PER DAY OR 40 HOURS PER WEEK.
V	DOUBLE TIME SHALL BE PAID FOR NEW YEAR'S DAY, EASTER SUNDAY, LABOR DAY, THANKSGIVING DAY, AND CHRISTMAS.
W	INCLUDES AMOUNT WITHHELD FOR ADMINISTRATIVE DUES.
X	TRADESMEN SHALL ONLY BE USED IF THE FIRST WORKER ON THE JOB IS A LANDSCAPE/IRRIGATION FITTER, SECOND WORKER MUST BE A LANDSCAPE/IRRIGATION FITTER OR APPRENTICE LANDSCAPE/IRRIGATION FITTER. THE 3RD AND 4TH MAY BE A TRADESMAN. THE 5TH MUST BE A LANDSCAPE/IRRIGATION FITTER AND THEREAFTER TRADESMEN WILL BE REFERRED ON A 50-50 BASIS, TO JOURNEYMAN OR APPRENTICE.
Y	INCLUDES AN AMOUNT FOR 401A PLAN.
Z	INCLUDES AN AMOUNT FOR THE P.I.P.E. LABOR MANAGEMENT COOPERATION COMMITTEE TRUST FUND AND FOR PROMOTION FUND.
AA	SATURDAY MAY BE PAID AT STRAIGHT TIME IF THE WORK WEEK IS TUESDAY THROUGH SATURDAY.
AB	RATE APPLIES TO WORK ON HOLIDAYS ONLY; SUNDAYS ARE PAID AT THE SATURDAY OVERTIME HOURLY RATE.
AC	RATE APPLIES TO VENTURA COUNTY EXCEPT FOR THE FOLLOWING CITIES OR COMMUNITIES: CASITAS SPRINGS, COLONIA, EL RIO, FARIA, FOSTER PARK, HOLLYWOOD BEACH, LA CONCHITA, LIVE OAK ACRES, LOCKWOOD VALLEY, MEINERS OAKS, MIRAMONTE, MONTALVO, OAK VIEW, OJAI, OXNARD, PIERPONT BAY, SAN BUENAVENTURA, SATICOY, SEACLIFF, SOLIMAR BEACH, SUMMIT, VENTURA AND WHEELER SPRINGS.
AD	AMOUNT IS FOR INDUSTRY PROMOTION FUND AND P.I.P.E. FUND.

LOCALITY: VENTURA COUNTY

DETERMINATION: VEN-2020-2

AE RATE APPLIES TO THE FIRST 4 DAILY OVERTIME HOURS AND THE FIRST 10 HOURS ON SATURDAY; ALL OTHER TIME IS PAID AT THE SUNDAY AND HOLIDAY OVERTIME HOURLY RATE.

AF INCLUDES AN AMOUNT PER HOUR WORKED FOR COLA FUND.

AG RATE APPLIES TO THE FIRST 4 DAILY OVERTIME HOURS AND THE FIRST 8 HOURS WORKED ON SATURDAY. ALL OTHER TIME IS PAID AT THE SUNDAY AND HOLIDAY OVERTIME RATE.

RECOGNIZED HOLIDAYS: HOLIDAYS UPON WHICH THE GENERAL PREVAILING HOURLY WAGE RATE FOR HOLIDAY WORK SHALL BE PAID, SHALL BE ALL HOLIDAYS IN THE COLLECTIVE BARGAINING AGREEMENT, APPLICABLE TO THE PARTICULAR CRAFT, CLASSIFICATION, OR TYPE OF WORKER EMPLOYED ON THE PROJECT, WHICH IS ON FILE WITH THE DIRECTOR OF INDUSTRIAL RELATIONS. IF THE PREVAILING RATE IS NOT BASED ON A COLLECTIVELY BARGAINED RATE, THE HOLIDAYS UPON WHICH THE PREVAILING RATE SHALL BE PAID SHALL BE AS PROVIDED IN SECTION 6700 OF THE GOVERNMENT CODE. YOU MAY OBTAIN THE HOLIDAY PROVISIONS FOR THE CURRENT DETERMINATIONS ON THE INTERNET AT HTTP://WWW.DIR.CA.GOV/OPRL/DPREWAGEDETERMINATION.HTM. HOLIDAY PROVISIONS FOR CURRENT OR SUPERSEDED DETERMINATIONS MAY BE OBTAINED BY CONTACTING THE OFFICE OF THE DIRECTOR - RESEARCH UNIT AT (415) 703-4774.

TRAVEL AND/OR SUBSISTENCE PAYMENT: IN ACCORDANCE WITH LABOR CODE SECTIONS 1773.1 AND 1773.9, CONTRACTORS SHALL MAKE TRAVEL AND/OR SUBSISTENCE PAYMENTS TO EACH WORKER TO EXECUTE THE WORK. YOU MAY OBTAIN THE TRAVEL AND/OR SUBSISTENCE PROVISIONS FOR THE CURRENT DETERMINATIONS ON THE INTERNET @ HTTP://WWW.DIR.CA.GOV/OPRL/DPREWAGEDETERMINATION.HTM. TRAVEL AND/OR SUBSISTENCE REQUIREMENTS FOR CURRENT OR SUPERSEDED DETERMINATIONS MAY BE OBTAINED FROM THE OFFICE OF THE DIRECTOR - RESEARCH UNIT AT (415) 703-4774.

GENERAL PREVAILING WAGE DETERMINATION MADE AY THE DIRECTOR OF INDUSTRIAL RELATIONS

PURSUANT TO CALIFORNIA LAAOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

FOR COMMERCIAL AUILDING, HIGHWAY, HEAVY CONSTRUCTION AND DREDGING PROJECTS

LOCALITY: VENTURA COUNTY

DETERMINATION: VEN-2020-2

	CRAFT (JOURNEY LEVEL)	ISSUE DATE	EXPIRATION DATE	INCREASE 1			INCREASE 2			INCREASE 3			INCREASE 4			INCREASE 5			INCREASE 6			INCREASE 7			INCREASE 8		
				DATE OF NEXT CHANGE	AMOUNT OF INCREASE		DATE OF NEXT CHANGE	AMOUNT OF INCREASE		DATE OF NEXT CHANGE	AMOUNT OF INCREASE		DATE OF NEXT CHANGE	AMOUNT OF INCREASE		DATE OF NEXT CHANGE	AMOUNT OF INCREASE		DATE OF NEXT CHANGE	AMOUNT OF INCREASE		DATE OF NEXT CHANGE	AMOUNT OF INCREASE		DATE OF NEXT CHANGE	AMOUNT OF INCREASE	
	CARPET, LINOLEUM,																										
	RESILIENT TILE LAYER - SECOND SHIFT	8/22/2020	12/31/2020**	1/1/2021	$1.69	A	1/1/2022	$1.69	A																		
B	MATERIAL HANDLER - SECOND SHIFT	8/22/2020	12/31/2020**	1/1/2021	$1.45	C	1/1/2022	$1.45	C																		
	ELECTRICIAN																										
	SOUND INSTALLER 2ND SHIFT	2/22/2020	12/27/2020**	12/28/2020	$2.85	D	12/27/2021	$3.05	D																		
	SOUND INSTALLER 3RD SHIFT	2/22/2020	12/27/2020**	12/28/2020	$2.85	D	12/27/2021	$3.05	D																		
	PLUMBER																										
	PLUMBER, INDUSTRIAL AND GENERAL PIPEFITTER (2ND SHIFT)	8/22/2020	08/31/2021**	9/1/2021	$2.26	D	9/1/2022	$2.26	D	9/1/2023	$2.35	D	9/1/2024	$2.50	D	9/1/2025	$2.50	D									
	SEWER AND STORM DRAIN PIPELAYER (2ND SHIFT)	8/22/2020	08/31/2021**	9/1/2021	$2.26	D	9/1/2022	$2.26	D	9/1/2023	$2.35	D	9/1/2024	$2.50	D	9/1/2025	$2.50	D									
E	SEWER AND STORM DRAIN PIPE TRADESMAN (2ND SHIFT)	8/22/2020	08/31/2021**	9/1/2021	$0.90	D	9/1/2022	$0.90	D	9/1/2023	$0.94	D	9/1/2024	$1.00	D	9/1/2025	$1.00	D									
	SERVICE AND REPAIR (2ND SHIFT)	8/22/2020	08/31/2021**	9/1/2021	$2.26	D	9/1/2022	$2.26	D	9/1/2023	$2.35	D	9/1/2024	$2.50	D	9/1/2025	$2.50	D									
	LANDSCAPE/IRRIGATION FITTER SECOND SHIFT	8/22/2020	08/31/2021**	9/1/2021	$2.26	D	9/1/2022	$2.26	D	9/1/2023	$2.35	D	9/1/2024	$2.50	D	9/1/2025	$2.50	D									
F	LANDSCAPE/IRRIGATION TRADESMAN SECOND SHIFT	8/22/2020	08/31/2021**	9/1/2021	$0.59	D	9/1/2022	$0.59	D	9/1/2023	$0.61	D	9/1/2024	$0.65	D	9/1/2025	$0.65	D									
	REFRIGERATION SERVICE HVACR- 2ND SHIFT	8/22/2020	08/29/2021**	8/30/2021	$2.15	D	9/5/2022	$2.15	D	9/4/2023	$2.15	D															
	SHEET METAL WORKER																										
	SHEET METAL WORKER (SPECIAL SHIFT)	8/22/2020	07/31/2021**	8/1/2021	$2.75	G	8/1/2022	$2.75	H																		

FOOTNOTES

GENERAL PREVAILING WAGE DETERMINATION MADE BY THE DIRECTOR OF INDUSTRIAL RELATIONS

PURSUANT TO CALIFORNIA LABOR CODE PART 7, CHAPTER 1, ARTICLE 2, SECTIONS 1770, 1773 AND 1773.1

LOCALITY: VENTURA COUNTY

DETERMINATION: VEN-2020-2

A $1.44 TO THE BASIC HOURLY RATE, $0.15 TO HEALTH & WELFARE AND $0.10 TO VACATION/HOLIDAY.

B A MATERIAL HANDLER MAY BE UTILIZED IN RATIO OF ONE (1) MATERIAL HANDLER WITH ANY FIVE (5) JOURNEYMEN ON ANY GIVEN PROJECT.

C $1.20 TO THE BASIC HOURLY RATE, $0.15 TO HEALTH & WELFARE AND $0.10 TO VACATION/HOLIDAY.

D THE PREDETERMINED INCREASE SHOWN IS TO BE ALLOCATED TO WAGES AND/OR EMPLOYER PAYMENTS. PLEASE CONTACT THE OFFICE OF THE DIRECTOR - RESEARCH UNIT AT (415) 703-4774 WHEN THE PREDETERMINED INCREASE BECOMES DUE TO CONFIRM THE DISTRIBUTION. PLEASE ALSO EXAMINE THE IMPORTANT NOTICES TO SEE IF ANY MODIFICATIONS HAVE BEEN ISSUED, AS THERE MAY BE REDUCTIONS TO PREDETERMINED INCREASES.

E PIPE TRADESMEN SHALL NOT BE PERMITTED ON ANY JOB WITHOUT A JOURNEYMAN.

F TRADESMEN SHALL ONLY BE USED IF THE FIRST WORKER ON THE JOB IS A LANDSCAPE/IRRIGATION FITTER, SECOND WORKER MUST BE A LANDSCAPE/IRRIGATION FITTER OR APPRENTICE LANDSCAPE/IRRIGATION FITTER. THE 3RD AND 4TH MAY BE A TRADESMAN. THE 5TH MUST BE A LANDSCAPE/IRRIGATION FITTER AND THEREAFTER TRADESMEN WILL BE REFERRED ON A 50-50 BASIS, TO JOURNEYMAN OR APPRENTICE.

G $0.05 TO TRAINING AND $2.70 TO WAGES AND/OR FRINGES.

H $0.01 TO OTHER AND $2.74 TO WAGES AND/OR FRINGES.

VEN-2020-2-INC

Federal Prevailing Wages Rates

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"General Decision Number: CA20210015 03/19/2021
Superseded General Decision Number: CA20200015
State: California

Construction Types: Building, Heavy (Heavy and Dredging) and Highway

County: Ventura County in California.

BUILDING, DREDGING (does not include hopper dredge work), HEAVY (does not include water well drilling), AND HIGHWAY CONSTRUCTION PROJECTS

NOTE: Under Executive Order (EO) 13658, an hourly minimum wage of $10.95 for calendar year 2021 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.95 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate,if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/01/2021
1	01/08/2021
2	01/15/2021
3	02/12/2021
4	03/05/2021
5	03/19/2021

ASBE0005-002 07/06/2020	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials, protective coverings, coatings, and finishes to all types of mechanical systems)	$ 45.39	23.74
Fire Stop Technician (Application of Firestopping Materials for wall openings and penetrations in walls, floors, ceilings and curtain walls)	$ 28.92	18.73

ASBE0005-004 07/01/2019 Rates Fringes

Asbestos Removal
worker/hazardous material handler (Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems, whether they contain asbestos or not)……..... $ 20.63 12.17

BOIL0092-003 01/01/2021 Rates Fringes

BOILERMAKER……..... $ 46.03 38.81

BRCA0004-012 05/01/2020 Rates Fringes

BRICKLAYER; MARBLE SETTER..... $ 41.39 18.81

*The wage scale for prevailing wage projects performed in Blythe, China lake, Death Valley, Fort Irwin, Twenty-Nine Palms, Needles and 1-15 corridor (Barstow to the Nevada State Line) will be Three Dollars ($3.00) above the standard San Bernardino/Riverside County hourly wage rate
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BRCA0018-004 06/01/2019 RATES FRINGES

MARBLE FINISHER..... $ 33.43 14.11
TILE FINISHER..... $ 28.23 12.65
TILE LAYER..... $ 40.07 18.36

BRCA0018-010 09/01/2020 RATES FRINGES

TERRAZZO FINISHER..... $ 33.66 14.20
TERRAZZO WORKER/SETTER..... $ 41.60 14.73

CARP0409-001 07/01/2018 Rates Fringes
CARPENTER
(1) Carpenter, Cabinet Installer, Insulation Installer, Hardwood Floor Worker and acoustical installer..... $ 41.84 19.17
(2) Millwright..... $ 42.91 19.17
(3) Piledrivermen/Derrick Bargeman, Bridge or Dock Carpenter, Heavy Framer, Rock Bargeman or Scowman,
Rockslinger, Shingler (Commercial)..... $ 42.54 19.17

(4) Pneumatic Nailer, Power Stapler	$ 40.09	19.17
(5) Sawfiler	$ 39.83	19.17
(6) Scaffold Builder	$ 31.60	19.17
(7) Table Power Saw Operator	$ 40.93	19.17

FOOTNOTE: Work of forming in the construction of open cut sewers or storm drains, on operations in which horizontal lagging is used in conjunction with steel H-Beams driven or placed in pre- drilled holes, for that portion of a lagged trench against which concrete is poured, namely, as a substitute for back forms (which work is performed by piledrivers): $0.13 per hour additional.

CARP0409-002 07/01/2016	Rates	Fringes
Diver		
(1) Wet	$ 712.48	17.03
(2) Standby	$ 356.24	17.03
(3) Tender	$ 348.24	17.03
(4) Assistant Tender	$ 324.24	17.03

AMOUNTS IN ""RATES' COLUMN ARE PER DAY

CARP0409-005 07/01/2015	Rates	Fringes
Drywall		
DRYWALL INSTALLER/LATHER	$ 37.35	11.08
STOCKER/SCRAPPER	$ 10.00	7.17

CARP0409-008 08/01/2010	Rates	Fringes
Modular Furniture Installer	$ 17.00	7.41

ELEC0952-001 12/28/2020	Rates	Fringes
Electricians: (All work within 32 road miles from the nearest base point)		
Cable Splicer	$ 46.75	28.55
Electrician Transportation Systems TECHNICIAN JOURNEYMAN Wireman - Street Lighting & Traffic Signals	$ 42.50	28.43
Transportation Systems Technician - Street Lighting & Traffic Signals	$ 31.88	28.11

ALL WORK MORE THAN 32 ROAD MILES FROM NEAREST BASE POINT:

Add $5.00 to the basic hourly rate. BASE POINTS: the main Post Office in the cities of Camarillo, Oak View, Oxnard, Santa Paula and Ventura.

ELEC0952-003 12/28/2020

COMMUNICATIONS AND SYSTEMS WORK	Rates	Fringes
Communications System		
Installer	$ 39.82	14.78
Technician	$ 30.10	12.78

SCOPE OF WORK:
Installation, testing, service and maintenance of systems utilizing the transmission and/or transference of voice, sound, vision and digital for commercial, educational, security and entertainment purposes for the following: TV monitoring and surveillance, background-foreground music, intercom and telephone interconnect, inventory control systems, microwave transmission, multi-media, multiplex, nurse call systems, radio page, school intercom and sound, burglar alarms, fire alarm (see last paragraph below) and low voltage master clock systems in commercial buildings. Communication Systems that transmit or receive information and/or control systems that are intrinsic to the above listed systems; inclusion or exclusion of terminations and testings of conductors determined by their function; excluding all other data systems or multiple systems which include control function or power supply; excluding installation of raceway systems, conduit systems, line voltage work, and energy management systems. Does not cover work performed at China Lake Naval Ordnance Test Station. Fire alarm work shall be performed at the current inside wireman total cost package.

ELEV0018-001 01/01/2021	Rates	Fringes
ELEVATOR MECHANIC	$ 59.32	35.825+a+b

FOOTNOTE:
a. PAID VACATION: Employer contributes 8% of regular hourly rate as vacation pay credit for employees with more than 5 years of service, and 6% for 6 months to 5 years of service.
b. PAID HOLIDAYS: New Year's Day, Memorial Day, Independence Day, Labor Day, Veterans' Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

ENGI0012-003 07/01/2020	Rates	Fringes
OPERATOR: Power Equipment		
(All Other Work)		
GROUP 1	$ 48.25	27.20
GROUP 2	$ 49.03	27.20
GROUP 3	$ 49.32	27.20

GROUP 4	$ 50.81	27.20
GROUP 5	$ 48.96	25.25
GROUP 6	$ 51.03	27.20
GROUP 8	$ 51.14	27.20
GROUP 9	$ 49.29	25.25
GROUP 10	$ 51.26	27.20
GROUP 11	$ 49.41	25.25
GROUP 12	$ 51.43	27.20
GROUP 13	$ 51.53	27.20
GROUP 14	$ 51.56	27.20
GROUP 15	$ 51.64	27.20
GROUP 16	$ 51.76	27.20
GROUP 17	$ 51.93	27.20
GROUP 18	$ 52.03	27.20
GROUP 19	$ 52.14	27.20
GROUP 20	$ 52.26	27.20
GROUP 21	$ 52.43	27.20
GROUP 22	$ 52.53	27.20
GROUP 23	$ 52.64	27.20
GROUP 24	$ 52.76	27.20
GROUP 25	$ 52.93	27.20
OPERATOR: Power Equipment (Cranes, Piledriving & Hoisting)		
GROUP 1	$ 49.60	27.20
GROUP 2	$ 50.38	27.20
GROUP 3	$ 50.67	27.20
GROUP 4	$ 50.81	27.20
GROUP 5	$ 51.03	27.20
GROUP 6	$ 51.14	27.20
GROUP 7	$ 51.26	27.20
GROUP 8	$ 51.43	27.20
GROUP 9	$ 51.60	27.20
GROUP 10	$ 52.60	27.20
GROUP 11	$ 53.60	27.20
GROUP 12	$ 54.60	27.20
GROUP 13	$ 55.60	27.20
OPERATOR: Power Equipment (Tunnel Work)		
GROUP 1	$ 50.10	27.20
GROUP 2	$ 50.88	27.20
GROUP 3	$ 51.17	27.20
GROUP 4	$ 51.31	27.20
GROUP 5	$ 51.53	27.20
GROUP 6	$ 51.64	27.20

GROUP 7..... $ 51.76 27.20

PREMIUM PAY:
$3.75 per hour shall be paid on all Power Equipment Operator work on the followng Military Bases: China Lake Naval Reserve, Vandenberg AFB, Point Arguello, Seely Naval Base, Fort Irwin, Nebo Annex Marine Base, Marine Corp Logistics Base Yermo, Edwards AFB, 29 Palms Marine Base and Camp Pendleton

Workers required to suit up and work in a hazardous material environment: $2.00 per hour additional. Combination mixer and compressor operator on gunite work shall be classified as a concrete mobile mixer operator.

SEE ZONE DEFINITIONS AFTER CLASSIFICATIONS

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Bargeman; Brakeman; Compressor operator; Ditch Witch, with seat or similar type equipment; Elevator operator-inside; Engineer Oiler; Forklift operator (includes loed, lull or similar types under 5 tons; Generator operator; Generator, pump or compressor plant operator; Pump operator; Signalman; Switchman

GROUP 2: Asphalt-rubber plant operator (nurse tank operator); Concrete mixer operator-skip type; Conveyor operator; Fireman; Forklift operator (includes loed, lull or similar types over 5 tons; Hydrostatic pump operator; oiler crusher (asphalt or concrete plant); Petromat laydown machine; PJU side dum jack; Screening and conveyor machine operator (or similar types); Skiploader (wheel type up to 3/4 yd. without attachment); Tar pot fireman; Temporary heating plant operator; Trenching machine oiler

GROUP 3: Asphalt-rubber blend operator; Bobcat or similar type (Skid steer); Equipment greaser (rack); Ford Ferguson (with dragtype attachments); Helicopter radioman (ground); Stationary pipe wrapping and cleaning machine operator

GROUP 4: Asphalt plant fireman; Backhoe operator (mini-max or similar type); Boring machine operator; Boxman or mixerman (asphalt or concrete); Chip spreading machine operator;
Concrete cleaning decontamination machine operator; Concrete Pump Operator (small portable); Drilling machine operator, small auger types (Texoma super economatic or similar types - Hughes 100 or 200 or similar types - drilling depth of 30' maximum); Equipment greaser (grease truck); Guard rail post driver operator; Highline cableway signalman; Hydra-hammer-aero stomper; Micro Tunneling (above ground tunnel); Power concrete curing machine operator; Power concrete saw operator; Power-driven jumbo form setter operator; Power sweeper operator; Rock Wheel Saw/Trencher; Roller operator (compacting); Screed operator (asphalt or concrete); Trenching machine operator (up to 6 ft.); Vacuum or much truck

GROUP 5: Equipment Greaser (Grease Truck/Multi Shift).
GROUP 6: Articulating material hauler; Asphalt plant engineer; Batch plant operator; Bit sharpener; Concrete joint machine operator (canal and similar type); Concrete planer operator; Dandy digger; Deck engine operator; Derrickman (oilfield type); Drilling machine operator, bucket or auger types (Calweld 100 bucket

or similar types - Watson 1000 auger or similar types - Texoma 330, 500 or 600 auger or similar types - drilling depth of 45' maximum); Drilling machine operator; Hydrographic seeder machine operator (straw, pulp or seed), Jackson track maintainer, or similar type; Kalamazoo Switch tamper, or similar type; Machine tool operator; Maginnis internal full slab vibrator, Mechanical berm, curb or gutter(concrete or asphalt); Mechanical finisher operator (concrete, Clary-Johnson-Bidwell or similar); Micro tunnel system (below ground); Pavement breaker operator (truck mounted); Road oil mixing machine operator; Roller operator (asphalt or finish), rubber-tired earth moving equipment (single engine, up to and including 25 yds. struck); Self-propelled tar pipelining machine operator; Skiploader operator (crawler and wheel type, over 3/4 yd. and up to and including 1-1/2 yds.); Slip form pump operator (power driven hydraulic lifting device for concrete forms); Tractor operator-bulldozer, tamper-scraper (single engine, up to 100 h.p. flywheel and similar types, up to and including D-5 and similar types); Tugger hoist operator (1 drum); Ultra high pressure waterjet cutting tool system operator; Vacuum blasting machine operator

GROUP 8: Asphalt or concrete spreading operator (tamping or finishing); Asphalt paving machine operator (Barber Greene or similar type); Asphalt-rubber distribution operator; Backhoe operator (up to and including 3/4 yd.), small ford, Case or similar; Cast-in-place pipe laying machine operator; combination mixer and compressor operator (gunite work); Compactor operator (self-propelled); Concrete mixer operator (paving); Crushing plant operator; Drill Doctor; Drilling machine operator, Bucket or auger types (Calweld 150 bucket or similar types - Watson 1500, 2000 2500 auger or similar types - Texoma 700, 800 auger or similar types - drilling depth of 60' maximum); Elevating grader operator; Grade checker; Gradall operator; Grouting machine operator; Heavy-duty repairman; Heavy equipment robotics operator; Kalamazoo balliste regulator or similar type; Kolman belt loader and similar type; Le Tourneau blob compactor or similar type; Loader operator (Athey, Euclid, Sierra and similar types); Mobark Chipper or similar; Ozzie padder or similar types; P.C. slot saw; Pneumatic concrete placing machine operator (Hackley-Presswell or similar type); Pumpcrete gun operator; Rock Drill or similar types; Rotary drill operator (excluding caisson type); Rubber-tired earth-moving equipment operator (single engine, caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. up to and including 50 cu. yds. struck); Rubber-tired earth-moving equipment operator (multiple engine up to and including 25 yds. struck); Rubber-tired scraper operator (self-loading paddle wheel type-John Deere, 1040 and similar single unit); Self-propelled curb and gutter machine operator; Shuttle buggy; Skiploader operator (crawler and wheel type over 1-1/2 yds. up to and including 6-1/2 yds.); Soil remediation plant operator; Surface heaters and planer operator; Tractor compressor drill combination operator; Tractor operator (any type larger than D-5 - 100 flywheel h.p. and over, or similar-bulldozer, tamper, scraper and push tractor single engine); Tractor operator (boom attachments), Traveling pipe wrapping, cleaning and bendng machine operator; Trenching machine operator (over 6 ft. depth capacity, manufacturer's rating); trenching Machine with Road Miner attachment (over 6 ft depth capacity): Ultra high pressure waterjet cutting tool system mechanic; Water pull (compaction) operator

GROUP 9: Heavy Duty Repairman

GROUP 10: Drilling machine operator, Bucket or auger types (Calweld 200 B bucket or similar types-Watson 3000 or 5000 auger or similar types-Texoma 900 auger or similar types-drilling depth of 105' maximum); Dual drum mixer, dynamic compactor LDC350 (or similar types); Monorail locomotive operator (diesel, gas or electric); Motor patrol-blade operator (single engine); Multiple engine tractor operator (Euclid and similar type-except Quad 9 cat.); Rubber-tired earth-moving equipment operator (single engine, over 50 yds. struck); Pneumatic pipe ramming tool and similar types; Prestressed wrapping machine operator; Rubber-tired earth-moving equipment operator (single engine, over 50 yds. struck); Rubber tired earth moving equipment operator (multiple engine, Euclid, caterpillar and similar over 25 yds. and up to 50 yds. struck), Tower crane repairman; Tractor loader operator (crawler and wheel type over 6-1/2 yds.); Woods mixer operator (and similar Pugmill equipment)

GROUP 11: Heavy Duty Repairman - Welder Combination, Welder - Certified.

GROUP 12: Auto grader operator; Automatic slip form operator; Drilling machine operator, bucket or auger types (Calweld, auger 200 CA or similar types - Watson, auger 6000 or similar types - Hughes Super Duty, auger 200 or similar types - drilling depth of 175' maximum); Hoe ram or similar with compressor; Mass excavator operator less than 750 cu. yards; Mechanical finishing machine operator; Mobile form traveler operator; Motor patrol operator (multi-engine); Pipe mobile machine operator; Rubber-tired earth- moving equipment operator (multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck); Rubber-tired self- loading scraper operator (paddle-wheel-auger type self-loading - two (2) or more units)

GROUP 13: Rubber-tired earth-moving equipment operator operating equipment with push-pull system (single engine, up to and including 25 yds. struck)

GROUP 14: Canal liner operator; Canal trimmer operator; Remote- control earth-moving equipment operator (operating a second piece of equipment: $1.00 per hour additional); Wheel excavator operator (over 750 cu. yds.)

GROUP 15: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. and up to and including 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine-up to and including 25 yds. struck)

GROUP 16: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 17: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (multiple engine, Euclid, Caterpillar and similar, over 50 cu. yds. struck); Tandem tractor operator (operating crawler type tractors in tandem - Quad 9 and similar type)

GROUP 18: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, up to and including 25 yds. struck)

GROUP 19: Rotex concrete belt operator (or similar types); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds.and up to and including 50 cu. yds. struck); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - multiple engine, up to and including 25 yds. struck)

GROUP 20: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps, and similar types in any combination, excluding compaction units - multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 21: Rubber-tired earth-moving equipment operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck)

GROUP 22: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, up to and including 25 yds. struck)

GROUP 23: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, Caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. and up to and including 50 yds. struck); Rubber-tired earth-moving equipment operator, operating with the tandem push-pull system (multiple engine, up to and including 25 yds. struck)

GROUP 24: Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

GROUP 25: Concrete pump operator-truck mounted; Rubber-tired earth-moving equipment operator, operating equipment with the tandem push-pull system (multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck)

CRANES, PILEDRIVING AND HOISTING EQUIPMENT CLASSIFICATIONS

GROUP 1: Engineer oiler; Fork lift operator (includes loed, lull or similar types)

GROUP 2: Truck crane oiler

GROUP 3: A-frame or winch truck operator; Ross carrier operator (jobsite)

GROUP 4: Bridge-type unloader and turntable operator; Helicopter hoist operator

GROUP 5: Hydraulic boom truck; Stinger crane (Austin-Western or similar type); Tugger hoist operator (1 drum)

GROUP 6: Bridge crane operator; Cretor crane operator; Hoist operator (Chicago boom and similar type); Lift mobile operator; Lift slab machine operator (Vagtborg and similar types); Material hoist and/or manlift operator; Polar gantry crane operator; Self Climbing scaffold (or similar type); Shovel, backhoe, dragline, clamshell operator (over 3/4 yd. and up to 5 cu. yds. mrc); Tugger hoist operator

GROUP 7: Pedestal crane operator; Shovel, backhoe, dragline, clamshell operator (over 5 cu. yds. mrc); Tower crane repair; Tugger hoist operator (3 drum)

GROUP 8: Crane operator (up to and including 25 ton capacity); Crawler transporter operator; Derrick barge operator (up to and including 25 ton capacity); Hoist operator, stiff legs, Guy derrick or similar type (up to and including 25 ton capacity); Shovel, backhoe, dragline, clamshell operator (over 7 cu. yds., M.R.C.)

GROUP 9: Crane operator (over 25 tons and up to and including 50 tons mrc); Derrick barge operator (over 25 tons up to and including 50 tons mrc); Highline cableway operator; Hoist operator, stiff legs, Guy derrick or similar type (over 25 tons up to and including 50 tons mrc); K-crane operator; Polar crane operator; Self erecting tower crane operator maximum lifting capacity ten tons

GROUP 10: Crane operator (over 50 tons and up to and including 100 tons mrc); Derrick barge operator (over 50 tons up to and including 100 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 50 tons up to and including 100 tons mrc), Mobile tower crane operator (over 50 tons, up to and including 100 tons M.R.C.); Tower crane operator and tower gantry

GROUP 11: Crane operator (over 100 tons and up to and including 200 tons mrc); Derrick barge operator (over 100 tons up to and including 200 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 100 tons up to and including 200 tons mrc); Mobile tower crane operator (over 100 tons up to and including 200 tons mrc)

GROUP 12: Crane operator (over 200 tons up to and including 300 tons mrc); Derrick barge operator (over 200 tons up to and including 300 tons mrc); Hoist operator, stiff legs, Guy derrick or similar type (over 200 tons, up to and including 300 tons mrc); Mobile tower crane operator (over 200 tons, up to and including 300 tons mrc)

GROUP 13: Crane operator (over 300 tons); Derrick barge operator (over 300 tons); Helicopter pilot; Hoist operator, stiff legs, Guy derrick or similar type (over 300 tons); Mobile tower crane operator (over 300 tons)

TUNNEL CLASSIFICATIONS

GROUP 1: Skiploader (wheel type up to 3/4 yd. without attachment)

GROUP 2: Power-driven jumbo form setter operator

GROUP 3: Dinkey locomotive or motorperson (up to and including 10 tons)

GROUP 4: Bit sharpener; Equipment greaser (grease truck); Slip form pump operator (power-driven hydraulic lifting device for concrete forms); Tugger hoist operator (1 drum); Tunnel locomotive operator (over 10 and up to and including 30 tons)

GROUP 5: Backhoe operator (up to and including 3/4 yd.); Small Ford, Case or similar; Drill doctor; Grouting machine operator; Heading shield operator; Heavy-duty repairperson; Loader operator (Athey, Euclid, Sierra and similar types); Mucking machine operator (1/4 yd., rubber-tired, rail or track type); Pneumatic concrete placing machine operator (Hackley-Presswell or similar type); Pneumatic heading
shield (tunnel); Pumpcrete gun operator; Tractor compressor drill combination operator; Tugger hoist operator (2 drum); Tunnel locomotive operator (over 30 tons)

GROUP 6: Heavy Duty Repairman

GROUP 7: Tunnel mole boring machine operator

ENGINEERS ZONES

$1.00 additional per hour for all of IMPERIAL County and the portions of KERN, RIVERSIDE & SAN BERNARDINO Counties as defined below:

That area within the following Boundary: Begin in San Bernardino County, approximately 3 miles NE of the intersection of I-15 and the California State line at that point which is the NW corner of Section 1, T17N,m R14E, San Bernardino Meridian. Continue W in a straight line to that point which is the SW corner of the northwest quarter of Section 6, T27S, R42E, Mt. Diablo Meridian. Continue North to the intersection with the Inyo County Boundary at that point which is the NE corner of the western half of the northern quarter of Section 6, T25S, R42E, MDM. Continue W along the Inyo and San Bernardino County boundary until the intersection with Kern County, as that point which is the SE corner of Section 34, T24S, R40E, MDM. Continue W along the Inyo and Kern County boundary until the intersection with Tulare County, at that point which is the SW corner of the SE quarter of Section 32, T24S, R37E, MDM. Continue W along the Kern and Tulare County boundary, until that point which is the NW corner of T25S, R32E, MDM. Continue S following R32E lines to the NW corner of T31S, R32E, MDM. Continue W to the NW corner of T31S, R31E, MDM. Continue S to the SW corner of T32S, R31E, MDM. Continue W to SW corner of SE quarter of Section 34, T32S, R30E, MDM. Continue S to SW corner of T11N, R17W, SBM. Continue E along south boundary of T11N, SBM to SW corner of T11N, R7W, SBM. Continue S to SW corner of T9N, R7W, SBM. Continue E along south boundary of T9N, SBM to SW corner of T9N, R1E, SBM. Continue S along west

boundary of R1E, SMB to Riverside County line at the SW corner of T1S, R1E, SBM. Continue E along south boundary of T1s, SBM (Riverside County Line) to SW corner of T1S, R10E, SBM. Continue S along west boundary of R10E, SBM to Imperial County line at the SW corner of T8S, R10E, SBM. Continue W along Imperial and Riverside county line to NW corner of T9S, R9E, SBM. Continue S along the boundary between Imperial and San Diego Counties, along the west edge of R9E, SBM to the south boundary of Imperial County/California state line. Follow the California state line west to Arizona state line, then north to Nevada state line, then continuing NW back to start at the point which is the NW corner of Section 1, T17N, R14E, SBM

$1.00 additional per hour for portions of SAN LUIS OBISPO, KERN, SANTA BARBARA & VENTURA as defined below:

That area within the following Boundary: Begin approximately 5 miles north of the community of Cholame, on the Monterey County and San Luis Obispo County boundary at the NW corner of T25S, R16E, Mt. Diablo Meridian. Continue south along the west side of R16E to the SW corner of T30S, R16E, MDM. Continue E to SW corner of T30S, R17E, MDM. Continue S to SW corner of T31S, R17E, MDM. Continue E to SW corner of T31S, R18E, MDM. Continue S along West side of R18E, MDM as it crosses into San Bernardino Meridian numbering area and becomes R30W. Follow the west side of R30W, SBM to the SW corner of T9N, R30W, SBM. Continue E along the south edge of T9N, SBM to the Santa Barbara County and Ventura County boundary at that point which is the SW corner of Section 34.T9N, R24W, SBM, continue S along the Ventura County line to that point which is the SW corner of the SE quarter of Section 32, T7N, R24W, SBM. Continue E along the south edge of T7N, SBM to the SE corner to T7N, R21W, SBM. Continue N along East side of R21W, SBM to Ventura County and Kern County boundary at the NE corner of T8N, R21W. Continue W along the Ventura County and Kern County boundary to the SE corner of T9N, R21W. Continue North along the East edge of R21W, SBM to the NE corner of T12N, R21W, SBM. Continue West along the north edge of T12N, SBM to the SE corner of T32S, R21E, MDM. [T12N SBM is a think strip between T11N SBM and T32S MDM]. Continue North along the East side of R21E, MDM to the Kings County and Kern County border at the NE corner of T25S, R21E, MDM, continue West along the Kings County and Kern County Boundary until the intersection of San Luis Obispo County. Continue west along the Kings County and San Luis Obispo County boundary until the intersection with Monterey County. Continue West along the Monterey County and San Luis Obispo County boundary to the beginning point at the NW corner of T25S, R16E, MDM.

$2.00 additional per hour for INYO and MONO Counties and the Northern portion of SAN BERNARDINO County as defined below:

That area within the following Boundary: Begin at the intersection of the northern boundary of Mono County and the California state line at the point which is the center of Section 17, T10N, R22E, Mt. Diablo Meridian. Continue S then SE along the entire western boundary of Mono County, until it reaches Inyo County at the point which is the NE corner of the Western half of the NW quarter of Section 2, T8S, R29E, MDM. Continue SSE along the entire western boundary of Inyo County, until the intersection with Kern County at the point which is the SW corner of the SE 1/4 of Section 32, T24S, R37E, MDM. Continue E along the Inyo and Kern County boundary until the intersection with San Bernardino County at that point which is the SE corner of

section 34, T24S, R40E, MDM. Continue E along the Inyo and San Bernardino County boundary until the point which is the NE corner of the Western half of the NW quarter of Section 6, T25S, R42E, MDM. Continue S to that point which is the SW corner of the NW quarter of Section 6, T27S, R42E, MDM. Continue E in a straight line to the California and Nevada state border at the point which is the NW corner of Section 1, T17N, R14E, San Bernardino Meridian. Then continue NW along the state line to the starting point, which is the center of Section 18, T10N, R22E, MDM.

REMAINING AREA NOT DEFINED ABOVE RECIEVES BASE RATE

ENGI0012-004 08/01/2020	Rates	Fringes
OPERATOR: Power Equipment (DREDGING)		
(1) LEVERMAN	$ 56.40	30.00
(2) Dredge dozer	$ 50.43	30.00
(3) Deckmate	$ 50.32	30.00
(4) Winch operator (stern WINCH ON DREDGE)	$ 49.77	30.00
(5) Fireman-Oiler, Deckhand, Bargeman, Leveehand	$ 49.23	30.00
(6) Barge Mate	$ 49.84	30.00

IRON0433-006 07/01/2020	Rates	Fringes
IRONWORKER		
Fence Erector	$ 34.58	24.81
Ornamental, Reinforcing AND STRUCTURAL	$ 41.00	33.45

PREMIUM PAY:

$6.00 additional per hour at the following locations:

China Lake Naval Test Station, Chocolate Mountains Naval Reserve-Niland, Edwards AFB, Fort Irwin Military Station, Fort Irwin Training Center-Goldstone, San Clemente Island, San Nicholas Island, Susanville Federal Prison, 29 Palms - Marine Corps, U.S. Marine Base - Barstow, U.S. Naval Air Facility - Sealey, Vandenberg AFB

$4.00 additional per hour at the following locations:

Army Defense Language Institute - Monterey, Fallon Air Base, Naval Post Graduate School - Monterey, Yermo Marine Corps Logistics Center

$2.00 additional per hour at the following locations:

Port Hueneme, Port Mugu, U.S. Coast Guard Station - Two Rock

LABO0300-005 03/01/2021	Rates	Fringes
Asbestos Removal Laborer	$ 37.49	21.88

SCOPE OF WORK: Includes site mobilization, initial site cleanup, site preparation, removal of asbestos-containing material and toxic waste, encapsulation, enclosure and disposal of asbestos- containing materials and toxic waste by hand or with equipment or machinery; scaffolding, fabrication of temporary wooden barriers and assembly of decontamination stations.

LABO0345-001 07/01/2020	Rates	Fringes
LABORER (GUNITE)		
GROUP 1	$ 45.05	19.62
GROUP 2	$ 44.10	19.62
GROUP 3	$ 40.56	19.62

FOOTNOTE: GUNITE PREMIUM PAY: Workers working from a Bosn'n's Chair or suspended from a rope or cable shall receive 40 cents per hour above the foregoing applicable classification rates. Workers doing gunite and/or shotcrete work in a tunnel shall receive 35 cents per hour above the foregoing applicable classification rates, paid on a portal-to-portal basis. Any work performed on, in or above any smoke stack, silo, storage elevator or similar type of structure, when such structure is in excess of 75'-0" above base level and which work must be performed in whole or in part more than 75'-0"" above base level, that work performed above the 75'-0"" level shall be compensated for at 35 cents per hour above the applicable classification wage rate.

GUNITE LABORER CLASSIFICATIONS

GROUP 1: Rodmen, Nozzlemen

GROUP 2: Gunmen

GROUP 3: Reboundmen

LABO0585-001 07/01/2020	Rates	Fringes
LABORER (TUNNEL)		
GROUP 1	$ 42.54	21.04
GROUP 2	$ 42.86	21.04
GROUP 3	$ 43.32	21.04
GROUP 4	$ 44.01	21.04
LABORER		
GROUP 1	$ 36.39	21.04
GROUP 2	$ 36.94	21.04
GROUP 3	$ 37.49	21.04
GROUP 4	$ 39.04	21.04
GROUP 5	$ 39.39	21.04

LABORER CLASSIFICATIONS

GROUP 1: Cleaning and handling of panel forms; Concrete screeding for rough strike-off; Concrete, water curing; Demolition laborer, the cleaning of brick if performed by a worker performing any other phase of demolition work, and the cleaning of lumber; Fire watcher, limber, brush loader, piler and debris handler; Flag person; Gas, oil and/or water pipeline laborer; Laborer, asphalt-rubber material loader; Laborer, general or construction; Laborer, general clean-up; Laborer, landscaping; Laborer, jetting; Laborer, temporary water and air lines; Material hose operator (walls, slabs, floors and decks); Plugging, filling of sheet bolt holes; Dry packing of concrete; Railroad maintenance, repair track person and road beds; Streetcar and railroad construction track laborers; Rigging and signaling; Scaler; Slip form raiser; Tar and mortar; Tool crib or tool house laborer; Traffic control by any method; Window cleaner; Wire mesh pulling - all concrete pouring operations

GROUP 2: Asphalt shoveler; Cement dumper (on 1 yd. or larger mixer and handling bulk cement); Cesspool digger and installer; Chucktender; Chute handler, pouring concrete, the handling of the chute from readymix trucks, such as walls, slabs, decks, floors, foundation, footings, curbs, gutters and sidewalks; Concrete curer, impervious membrane and form oiler; Cutting torch operator (demolition); Fine grader, highways and street paving, airport, runways and similar type heavy construction; Gas, oil and/or water pipeline wrapper - pot tender and form person; Guinea chaser; Headerboard person - asphalt; Laborer, packing rod steel and pans; Membrane vapor barrier installer; Power broom sweeper (small); Riprap stonepaver, placing stone or wet sacked concrete; Roto scraper and tiller; Sandblaster (pot tender); Septic tank digger and installer(lead); Tank scaler and cleaner; Tree climber, faller, chain saw operator, Pittsburgh chipper and similar type brush shredder; Underground laborer, including caisson bellower

GROUP 3: Buggymobile person; Concrete cutting torch; Concrete pile cutter; Driller, jackhammer, 2-1/2 ft. drill steel or longer; Dri-pak-it machine; Gas, oil and/or water pipeline wrapper, 6-in. pipe and over, by any method, inside and out; High scaler (including drilling of same); Hydro seeder and similar type; Impact wrench multi-plate; Kettle person, pot person and workers applying asphalt, lay-kold, creosote, lime caustic

and similar type materials (""applying"" means applying, dipping, brushing or handling of such materials for pipe wrapping and waterproofing); Operator of pneumatic, gas, electric tools, vibrating machine, pavement breaker, air blasting, come-alongs, and similar mechanical tools not separately classified herein; Pipelayer's backup person, coating, grouting, making of joints, sealing, caulking, diapering and including rubber gasket joints, pointing and any and all other services; Rock slinger; Rotary scarifier or multiple head concrete chipping scarifier; Steel headerboard and guideline setter; Tamper, Barko, Wacker and similar type; Trenching machine, hand-propelled

GROUP 4: Asphalt raker, lute person, ironer, asphalt dump person, and asphalt spreader boxes (all types); Concrete core cutter (walls, floors or ceilings), grinder or sander; Concrete saw person, cutting walls or flat work, scoring old or new concrete; Cribber, shorer, lagging, sheeting and trench bracing, hand-guided lagging hammer; Head rock slinger; Laborer, asphalt- rubber distributor boot person; Laser beam in connection with laborers' work; Oversize concrete vibrator operator, 70 lbs. and over; Pipelayer performing all services in the laying and installation of pipe from the point of receiving pipe in the ditch until completion of operation, including any and all forms of tubular material, whether pipe, metallic or non-metallic, conduit and any other stationary type of tubular device used for the conveying of any substance or element, whether water, sewage, solid gas, air, or other product whatsoever and without regard to the nature of material from which the tubular material is fabricated; No-joint pipe and stripping of same; Prefabricated manhole installer; Sandblaster (nozzle person), water blasting, Porta Shot-Blast

GROUP 5: Blaster powder, all work of loading holes, placing and blasting of all powder and explosives of whatever type, regardless of method used for such loading and placing; Driller: All power drills, excluding jackhammer, whether core, diamond, wagon, track, multiple unit, and any and all other types of mechanical drills without regard to the form of motive power; Toxic waste removal

TUNNEL LABORER CLASSIFICATIONS

GROUP 1: Batch plant laborer; Changehouse person; Dump person; Dump person (outside); Swamper (brake person and switch person on tunnel work); Tunnel materials handling person; Nipper; Pot tender, using mastic or other materials (for example, but not by way of limitation, shotcrete, etc.)

GROUP 2: Chucktender, cabletender; Loading and unloading agitator cars; Vibrator person, jack hammer, pneumatic tools (except driller); Bull gang mucker, track person; Concrete crew, including rodder and spreader

GROUP 3: Blaster, driller, powder person; Chemical grout jet person; Cherry picker person; Grout gun person; Grout mixer person; Grout pump person; Jackleg miner; Jumbo person; Kemper and other pneumatic concrete placer operator; Miner, tunnel (hand or machine); Nozzle person; Operating of troweling and/or grouting machines; Powder person (primer house); Primer person; Sandblaster; Shotcrete person; Steel form raiser and setter; Timber person, retimber person, wood or steel; Tunnel Concrete finisher

GROUP 4: Diamond driller; Sandblaster; Shaft and raise work

LABO0585-003 07/01/2020	Rates	Fringes
Brick Tender	$ 34.00	19.77

LABO1184-001 07/01/2020	Rates	Fringes
Laborers: (HORIZONTAL DIRECTIONAL DRILLING)		
(1) Drilling Crew Laborer	$ 37.85	15.99
(2) Vehicle Operator/Hauler	$ 38.02	15.99
(3) Horizontal Directional Drill Operator	$ 39.87	15.99
(4) Electronic Tracking Locator	$ 41.87	15.99
Laborers: (STRIPING/SLURRY SEAL)		
GROUP 1	$ 39.06	19.01
GROUP 2	$ 40.36	19.01
GROUP 3	$ 42.37	19.01
GROUP 4	$ 44.11	19.01

LABORERS - STRIPING CLASSIFICATIONS

GROUP 1: Protective coating, pavement sealing, including repair and filling of cracks by any method on any surface in parking lots, game courts and playgrounds; carstops; operation of all related machinery and equipment; equipment repair technician

GROUP 2: Traffic surface abrasive blaster; pot tender - removal of all traffic lines and markings by any method (sandblasting, waterblasting, grinding, etc.) and preparation of surface for coatings. Traffic control person: controlling and directing traffic through both conventional and moving lane closures; operation of all related machinery and equipment

GROUP 3: Traffic delineating device applicator: Layout and application of pavement markers, delineating signs, rumble and traffic bars, adhesives, guide markers, other traffic delineating devices including traffic control. This category includes all traffic related surface preparation (sandblasting, waterblasting, grinding) as part of the application process. Traffic protective delineating system installer: removes, relocates, installs, permanently affixed roadside and parking delineation barricades, fencing, cable anchor, guard rail, reference signs, monument markers; operation of all related machinery and equipment; power broom sweeper

GROUP 4: Striper: layout and application of traffic stripes and markings; hot thermo plastic; tape traffic stripes and markings, including traffic control; operation of all related machinery and equipment

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LABO1414-001 08/05/2020	Rates	Fringes
LABORER		
PLASTER CLEAN-UP LABORER…..……..	$ 36.03	21.01
PLASTER TENDER.....	$ 38.58	21.01

Work on a swing stage scaffold: $1.00 per hour additional.

PAIN0036-007 07/01/2019	Rates	Fringes
Painters:		
(1) Repaint Including Lead Abatement.....	$ 25.40	15.87
(2) High Iron & Steel.....	$ 32.12	16.03
(3) Journeyman Painter including Lead Abatement……..	$ 30.04	16.03
(4) Industrial.....	$ 34.02	16.49
(5) All other work.....	$ 30.04	16.03

REPAINT of any previously painted structure. Exceptions: work involving the aerospace industry, breweries, commercial recreational facilities, hotels which operate commercial establishments as part of hotel service, and sports facilities.

HIGH IRON & STEEL:
Aerial towers, towers, radio towers, smoke stacks, flag poles (any flag poles that can be finished from the ground with a ladder excluded), elevated water towers, steeples and domes in their entirety and any other extremely high and hazardous work, cooning steel, bos'n chair, or other similar devices, painting in other high hazardous work shall be classified as high iron & steel

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PAIN0036-008 10/01/2020	Rates	Fringes
DRYWALL FINISHER/TAPER.....	$ 43.18	20.92

PAIN0036-015 01/01/2020	Rates	Fringes
GLAZIER.....	$ 43.45	23.39

FOOTNOTE: Additional $1.25 per hour for work in a condor, from the third (3rd) floor and up Additional $1.25 per hour for work on the outside of the building from a swing stage or any suspended contrivance, from the ground up

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PAIN1247-002 01/01/2021	Rates	Fringes
SOFT FLOOR LAYER	$ 38.75	14.03

PLAS0200-009 08/07/2019	Rates	Fringes
PLASTERER	$ 43.73	16.03

PLAS0500-002 07/01/2020	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 38.50	25.91

PLUM0016-001 09/01/2020	Rates	Fringes
PLUMBER/PIPEFITTER		
Work ONLY on new additions and remodeling of bars, restaurant, stores and commercial buildings not to exceed 5,000 sq. ft. of floor space	$ 50.70	23.73
Work ONLY on strip malls, light commercial, tenant improvement and remodel work	$ 38.73	22.06
All other work except work on new additions and remodeling of bars, restaurant, stores and commercial buildings not to exceed 5,000 sq. ft. of floor space and work on strip malls, light commercial, tenant improvement and remodel work	$ 52.28	24.71

PLUM0345-001 09/01/2020	Rates	Fringes
PLUMBER		
Landscape/Irrigation Fitter	$ 35.30	24.10
Sewer & Storm Drain Work	$ 39.39	21.48

ROOF0036-002 09/15/2020	Rates	Fringes
ROOFER	$ 40.77	18.22

FOOTNOTE: Pitch premium: Work on which employees are exposed to pitch fumes or required to handle pitch, pitch base or pitch impregnated products, or any material containing coal tar pitch, the entire roofing crew shall receive $1.75 per hour ""pitch premium"" pay.

SFCA0669-010 01/01/2021

DOES NOT INCLUDE PORT HUENEME, PORT MUGU, THE CITY OF SANTA PAULA, AND THAT PART OF VENTURA COUNTY WITHIN 25 MILES OF THE CITY LIMITS OF LOS ANGELES:

	Rates	Fringes
SPRINKLER FITTER (FIRE)	$ 39.83	26.23

SFCA0709-001 01/01/2021

PORT HUENEME, PORT MUGU, THE CITY OF SANTA PAULA, AND THAT PART OF VENTURA COUNTY WITHIN 25 MILES OF THE CITY LIMITS OF LOS ANGELES:

	Rates	Fringes
SPRINKLER FITTER (Fire)	$ 48.71	29.15

SHEE0273-002 08/01/2019	Rates	Fringes
SHEET METAL WORKER	$ 45.48	30.05

HOLIDAYS: New Year's Day, Martin Luther King Day, President's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Veterans Day,Thanksgiving Day & Friday after, Christmas Day

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TEAM0011-002 07/01/2020	Rates	Fringes
TRUCK DRIVER		
GROUP 1	$ 32.59	30.59
GROUP 2	$ 32.74	30.59
GROUP 3	$ 32.87	30.59
GROUP 4	$ 33.06	30.59
GROUP 5	$ 33.09	30.59
GROUP 6	$ 33.12	30.59
GROUP 7	$ 33.37	30.59
GROUP 8	$ 33.62	30.59
GROUP 9	$ 33.82	30.59
GROUP 10	$ 34.12	30.59
GROUP 11	$ 34.62	30.59
GROUP 12	$ 35.05	30.59

WORK ON ALL MILITARY BASES:
PREMIUM PAY: $3.00 per hour additional:
29 Palms Marine Base, Camp Roberts, China Lake, Edwards AFB, El Centro Naval Facility, Fort Irwin, Marine Corps Logistics Base at Nebo & Yermo, Mountain Warfare Training Center, Bridgeport, Point Arguello, Point Conception, Vandenberg AFB

TRUCK DRIVERS CLASSIFICATIONS

GROUP 1: Truck driver

GROUP 2: Driver of vehicle or combination of vehicles - 2 axles; Traffic control pilot car excluding moving heavy equipment permit load; Truck mounted broom

GROUP 3: Driver of vehicle or combination of vehicles - 3 axles; Boot person; Cement mason distribution truck; Fuel truck driver; Water truck - 2 axle; Dump truck, less than 16 yds. water level; Erosion control driver

GROUP 4: Driver of transit mix truck, under 3 yds.; Dumpcrete truck, less than 6-1/2 yds. water level

GROUP 5: Water truck, 3 or more axles; Truck greaser and tire person ($0.50 additional for tire person); Pipeline and utility working truck driver, including winch truck and plastic fusion, limited to pipeline and utility work; Slurry truck driver

GROUP 6: Transit mix truck, 3 yds. or more; Dumpcrete truck, 6-1/2 yds. water level and over; Vehicle or combination of vehicles - 4 or more axles; Oil spreader truck; Dump truck, 16 yds. to 25 yds. water level

GROUP 7: A Frame, Swedish crane or similar; Forklift driver; Ross carrier driver

GROUP 8: Dump truck, 25 yds. to 49 yds. water level; Truck repair person; Water pull - single engine; Welder

GROUP 9: Truck repair person/welder; Low bed driver, 9 axles or over

GROUP 10: Dump truck - 50 yds. or more water level; Water pull - single engine with attachment

GROUP 11: Water pull - twin engine; Water pull - twin engine with attachments; Winch truck driver - $1.25 additional when operating winch or similar special attachments

GROUP 12: Boom Truck 17K and above

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year.

Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU Indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an

interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

Attachment 1

Contractor's Materials and Equipment Submittal Checklist

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Contractor's Materials and Equipment Submittal Checklist

Owner: County of Ventura Department of Airports
2889 West 5th Street
Oxnard, California 93030
Phone: (805) 382-3022

CA Firm: TBD
Address
Phone Number

Contractor: TBD
Address
Phone Number

Project: Runway 7-25, Taxiway Connectors, and
Parallel Taxiway Pavement Reconstruction
AIP No. 3-06-0179-037-2020 and
03-06-0179-38-2021
Version: V 0
Date: 2/25/21

No.	Specification	Description	Rev.	Date Received	Date Returned	Action*	Remarks
1	SP-100	Safety Plan Compliance Document					
2	SP-100	Badging List					
3	SP-100	Key Personnel List					
4	SP-100	Survey Lines, Survey and Control					
5	SP-100	Record Drawings				Deferred	
6	SP-100	Schedule of Values				Upon Request	

DRAFT ONLY
TO BE UPDATED
UPON POINT OF
BID AWARD

No.	Specification	Description	Rev.	Date Received	Date Returned	Action*	Remarks
7	SP-100	Barricades and Delineators Material Sheets					
8	SP-100	Lighted Runway Closure Markers Material Sheets					
8	SP-100	AC Grinding / Mill Reports					
9	SP-100	Multi-axial Geogrid Material Sheets					
10	SP-100	Runway Threshold Monument Material Sheet					
11	SP-102	Compliance with pollution,Erosion and sillation Control (SWPPP)					
12	SP-106	Key Personnel					
13	SP-107	Schedule					
14	SP-108	Professional Partnering Facilitator					
15	FAA.P1 60-03	Certification of Compliance / Analysis				Upon Request	
16	FAA.P1 60-05	Field Office Specifications					

DRAFT ONLY
TO BE UPDATED
UPON POINT OF
BID AWARD

No.	Specification	Description	Rev.	Date Received	Date Returned	Action*	Remarks
17	FAA.P1 70-21	Insurance and Bonds					
18	FAA.P1 80-01	Sub-contractor Contracts					
19	FAA.P1 90-10	Construction Warranty				Deferred	
20	FAA.P1.90-11	Final Project Documentation - All documents except Payroll				Deferred	
21	FAA.P1.90-11	Certified Payroll				On-going	
22	FAA.P2.C-100	Contractor Quality Control Program					
23	FAA.P2.C-102	SWPPP and Responsible Personnel					
24	FAA.P2.C-102	Erosion Control Material Sheets					
25	FAA.P3.P-101	Crack Fill and Material Sheets					
26	FAA.P3.P-153	CLSM Mix Design					

DRAFT ONLY
TO BE UPDATED
UPON POINT OF
BID AWARD

No.	Specification	Description	Rev.	Date Received	Date Returned	Action*	Remarks
27	FAA.P3.P-155	Lime Treatment Material and Techniques					
28	FAA.P4.P-209	Crushed Agg. Base Mix Design					
29	FAA.P4.P-401	HMA Job Mix Formula					
30	FAA.P6.P-401	Ongoing QC Results for P-401 Payment				As needed	
31	FAA.P8.P-608	Seal Coat Material Sheet					
32	FAA.P9.P-605	Tack Coat Material Sheet					
33	FAA.P9.P-606	Light Adhesive Material Sheets					
34	FAA.P9.P-610	Concrete for Misc. Structures					
35	FAA.P9.P-620	Marking: Paint and Beads					
36	FAA.P9.P-620	Marking Reflectivity Tests				As needed	
37	FAA.P11.D-701	Storm Drain Pipe Material Sheet					

DRAFT ONLY
TO BE UPDATED
UPON POINT OF
BID AWARD

No.	Specification	Description	Rev.	Date Received	Date Returned	Action*	Remarks
38	FAA.P11.D-705	Pipe Underdrain and Cleanouts Material Sheets					
39	FAA.P11.D-751	Manholes and Catch basins Material Sheets					
40	FAA.P11.D-754	PCC Valley Gutter Mix Design					
41	FAA.P12.T-901	Seeding Mix Design					
42	FAA.P13.L-108	Electric Cable, Tape, Tags, Splices, and Grounding Rod Material Sheets					
43	FAA.P13.L-110	Duct Bank Material Sheet					
44	FAA.P13.L-115	Electrical Pullboxes and Junctions Cans					
45	FAA.P13.L-115	MALSF Materials					

DRAFT ONLY
TO BE UPDATED
UPON POINT OF
BID AWARD

No.	Specification	Description	Rev.	Date Received	Date Returned	Action*	Remarks
46	FAA.P13.L-125	Sign Material Sheets					
47	FAA.P13.L-125	Runway and Taxiway Light Material Sheets					

DRAFT ONLY
TO BE UPDATED UPON POINT OF BID AWARD

***NET= No Exceptions Taken; IEN=Implement Exceptions Noted; R/R = Revise and Resubmit; INC/R=Incomplete, Resubmit / Rejected**

Review is only for general conformance with the design concept of the Project, Specifications and Drawings. Corrections or comments made on the shop drawings during this review does not relieve the contractor from compliance with the requirements of the plans and specifications and applicable codes.

"No exception taken" for a specific item shall not mean acceptance or approval of an assembly of which the item is a component. Contractor is responsible for means, methods, techniques, sequences, materials, fabrication, and correctness of construction and for performing all Work and that of all other trades in a safe and satisfactory manner.

Note: This is a list of items required for review and approval by the RPR. There are numerous references throughout the specifications for records to be kept by the Contractor and to be made available to RPR are upon request that are not listed here.

Attachment 2

Geotechnical Engineer Report

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GEOTECHNICAL ENGINEERING REPORT
OXNARD AIRPORT
RUNWAY 7-25 AND TAXIWAY
CONNECTOR IMPROVEMENTS
2889 WEST 5TH STREET
OXNARD, CALIFORNIA
MEAD & HUNT, INC. PROJECT NO. 3138400-181115.01

July 10, 2020

Prepared for

Mr. Jeff Leonard, PE
Associate Practice Leader
Aviation Services
Mead & Hunt, Inc.

Prepared by

Earth Systems Pacific
4378 Old Santa Fe Road
San Luis Obispo, CA 93401

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Earth Systems
4378 Old Santa Fe Road | San Luis Obispo, CA 93401 | Ph: 805.544.3276 | www.earthsystems.com

July 10, 2020

FILE NO.: 302524-001

Mr. Jeff Leonard, PE
Associate Practice Leader, Aviation Services
Mead & Hunt, Inc.
1360 19th Hole Drive, Suite 200
Windsor, CA 95492-7717

PROJECT: OXNARD AIRPORT
RUNWAY 7-25 AND TAXIWAY CONNECTOR IMPROVEMENTS/RECONSTRUCTION
2889 WEST 5TH STREET
OXNARD, CALIFORNIA
MEAD & HUNT, INC. PROJECT NO. 3138400-181115.01

SUBJECT: Geotechnical Engineering Report - Final

CONTRACT REFERENCE: Service Work Order No. 1 by Mead & Hunt, Inc., Referencing Proposal to Provide a Geotechnical Engineering Investigation and Recommendations, Oxnard Airport, Runway and Taxiway Connector Rehabilitation / Reconstruction, Oxnard, California, by Earth Systems Pacific, Doc. No. 1804-100.PRP, dated April 26, 2018

Dear Mr. Leonard:

As per the referenced Service Work Order, this geotechnical engineering report has been prepared for use in the design of the Runway 7-25 and Taxiway Connector Improvements Project at Oxnard Airport in Oxnard, California. Boring logs and a boring location map, results of laboratory testing, and conclusions regarding CBR testing, earthwork shrinkage, and subsurface water and soil moisture contents are provided. This final report version incorporates responses to comments received from the client on a draft version issued on February 6, 2019.

We appreciate the opportunity to have provided geotechnical services for this project and look forward to working with you again in the future. If there are any questions concerning this report, please do not hesitate to contact the undersigned.

Sincerely,

Earth Systems Pacific

REGISTERED PROFESSIONAL ENGINEER FREDERICK J. POTTHAST No. GE 2369 Exp. 03/31/22 GEOTECHNICAL STATE OF CALIFORNIA

Fred J. Potthast, GE
Principal Engineer

Copy to: Mead & Hunt, Inc., Attn.: Edoardo Barber, and Jannet Loera

Doc. No.: 2007-039.SER/cr

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

This geotechnical engineering report has been completed for the client's use in the development of a preliminary pavement design for Runway 7-25 and Taxiway Connectors A through E at Oxnard Airport in Oxnard, California. Previous investigations of the pavement on the Airport were provided by this firm (ESP 2015) and by Miller Geosciences, Inc. (Miller 2014). Based on those reports, the existing pavement sections are known to consist of varying thicknesses of asphalt concrete (AC) over varying thicknesses of aggregate base (AB). Runway 7-25 and Taxiways A through E are in regular use currently.

In general, this report contains logs of the subsurface conditions encountered in our exploratory borings, the results of laboratory tests, and conclusions regarding CBR testing, earthwork shrinkage, and subsurface water and soil moisture contents. We understand that this report, and the previous investigations, will be used by the client and the owner to determine if rehabilitation or reconstruction of the runway and taxiway connectors will be necessary.

2.0 SCOPE OF SERVICES

The scope of work for this geotechnical engineering report included a general site reconnaissance, subsurface exploration, laboratory testing of soil samples, engineering evaluation of the data collected, and the preparation of this report. The investigation and subsequent recommendations were based on information and base maps provided by the client.

The report and recommendations are intended to be in general accordance with AC 150/5320-6F (FAA 2016), the client's requested work scope, and common geotechnical engineering practice in this area under similar conditions at this time. The tests were performed in general conformance with the standards noted, as modified by common geotechnical engineering practice in this area under similar conditions at this time.

It is our intent that this report be used exclusively by the client to determine if rehabilitation or reconstruction of the runway and taxiway connectors will be necessary. The information may also be used to develop plans for future projects; however, no other specific projects are planned at this time. Application beyond these intents is strictly at the user's risk. As there may be geotechnical issues yet to be resolved, the geotechnical engineer should be retained to provide consultation as the project progresses, to assist in verifying that pertinent geotechnical issues have been addressed and to aid in conformance with the intent of this report. In the event this

report is used to develop project plans, it may also be advantageous to retain the geotechnical engineer to review the grading and drainage plans as they near completion to further aid in conformance of the plans with the intent of this report.

This report does not address issues in the domain of the contractor such as, but not limited to, site safety, excavatability, shoring, temporary slope angles, construction methods, etc. Analysis of site geology and of the soil for corrosive potential, radioisotopes, asbestos (either naturally occurring or in man-made products), lead or mold potential, hydrocarbons, or other chemical properties are beyond the scope of this investigation. Ancillary features beyond the pavement areas covered by this report are also not within our scope and are not addressed.

In the event that there are any changes in the nature of the work scope, or if any assumptions used in the preparation of this report prove to be incorrect, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing.

3.0 FIELD INVESTIGATION

On October 28 through November 1, 2018, a total of 40 borings were extended on the runways and taxiways within the project area, during night-shift closure periods. The borings were drilled to a maximum depth of 10.0 feet below the existing pavement surfaces with a Mobile Drill rig, Model B-53, equipped with 6-inch outside diameter hollow stem auger and an automatic hammer for sampling. The approximate locations of the borings are shown on the Exploration Location Maps – Figures 1A and 1B, in Appendix A.

The boring locations, which were provided to us by the client, were identified and marked in the field during a site visit with airport staff on October 10, 2018. During the field meeting, the general areas of all requested boring locations were determined by airport staff to be clear of underground utility lines, with only slight adjustments in a few locations made to increase setback distances. A table with the actual boring locations identified by latitude and longitude, as determined using a Verizon Android Smartphone, is also included in Appendix A.

As the borings were drilled, soil samples were obtained using a 3-inch outside diameter ring-lined barrel sampler (ASTM D 3550-17 with shoe similar to D 2937-17) at approximate subgrade elevation. Standard penetration tests (SPT) using a 2-inch outside diameter split-spoon sampler were also performed in the borings (ASTM D 1586-11) from 5 to 6.5 feet and from 8.5 to 10.0 feet in each boring. Bulk samples were secured from the auger cuttings.

The pavement sections at each boring location were noted by direct measurement of the material layers in the boring. The soils underlying the pavement sections were initially classified and logged in general accordance with the Unified Soils Classification System (ASTM D 2488-17). Final classifications of the soils in accordance with the Unified Soils Classification System (ASTM D 2487-17) were made following completion of laboratory testing. Copies of the boring logs and a boring log legend can also be found in Appendix A. In reviewing the boring logs and legend, the reader should recognize that the legend is intended as a guideline only, and there are a number of conditions that may influence the soil characteristics as observed during drilling. These include, but are not limited to, cementation, variations in soil moisture, presence of groundwater, and other factors. Consequently, the logger must exercise judgment in interpreting soil characteristics, possibly resulting in soils descriptions that vary somewhat from the legend. Following completion of drilling, the borings were backfilled with cement-treated auger spoils and gravel, and then patched at the surface with cold-mix AC (Instant Road Repair by International Roadway Research).

4.0 LABORATORY INVESTIGATION

In situ moisture content and unit dry weight (ASTM D 2937-17, as modified for ring liners) were determined for the ring samples. Fourteen bulk samples were tested for the following: maximum density and optimum moisture (ASTM D 1557-12, modified), particle size distribution (ASTM D 422-63/07; D 1140-17), plasticity index (ASTM D 4318-17), and CBR (ASTM D 1883-16, for a range of moisture contents, with ASTM D 1557-12 as the reference standard for maximum density). Two additional bulk samples were tested for the same series of parameters, except that CBR testing was completed with the soils lime treated at 3, 5 and 7 percent by dry weight of soil at optimum moisture content only. One additional sample was tested for plasticity index (ASTM D 4318-17), and three additional samples were tested for particle size distribution (ASTM D 422-63/07; D 1140-17). Please refer to Appendix B for the laboratory test results.

5.0 GENERAL SUBSURFACE PROFILE

Variations in the thicknesses of the existing pavement sections were observed throughout the borings drilled in the project area.

The AC thicknesses found in the borings on the runway varied from 3 inches in Borings 4, 21 and 28, to 6.5 inches in Boring 8. The majority of the thicknesses measured in the other borings on the runway varied from 4 to 5.5 inches. The miscellaneous aggregate base (mAB) supporting the

AC on the runway varied from 8 inches in Borings 8 and 10, to as much as 17 inches found in Boring 28. The mAB on the runway consisted of clayey sand with gravel, silty sand with gravel, and silty gravel with sand.

On the connector taxiways, the borings encountered more uniform AC thicknesses of 4 to 5.5 inches, with one section (Boring 40) at 6 inches. The mAB thicknesses ranged from 3.5 inches in Boring 32, to 12 inches in Borings 37 and 38. The mAB on the connector taxiways consisted of silty sand with gravel, and silty gravel with sand.

The pavement sections found in each of the borings are noted on Figures 2A and 2B - Existing Pavement Section Thicknesses, in Appendix C.

Below the pavement sections, thin (4 to 8 inches) layers of loose to medium dense poorly graded sand fill were found, generally on the west side of the project area, in Borings 1 through 8, 31 through 34, and 36. Below the poorly graded sand, and below the pavement sections in all other borings, the underlying soil was fill consisting of sandy lean clay, silty sand and lean clay to depths ranging from 2 to 5 feet below the existing pavement surfaces. Variable amounts of gravel were noted in the fill. The silty sand fill in Boring 33 contained traces of AC fragments; in Boring 40 the silty sand fill was mixed with sandy lean clay. In general, the silty sands were medium dense, and the clays were medium stiff to very stiff.

Alluvium was found below the fill in all of the borings, to the maximum depth explored of 10 feet below the existing pavement surfaces. The alluvium consisted of very soft to medium stiff sandy lean clay, silt, and lean clay; a layer of loose silty sand was also found in the alluvium in Boring 25.

The soils were described during drilling as being slightly moist to very moist. Subsurface water was not encountered in any of the borings, to the maximum depth explored of 10 feet below the existing pavement surface. However, caliche deposits, a residual mineral in the soil indicating the past presence of subsurface water, were found at various depths in 32 of the 40 borings drilled for this project.

Please refer to the logs in Appendix A for a more complete description of the subsurface conditions found in the borings.

Figures 3A and 3B – USCS Soil Types at Subgrade, in Appendix C, is a summary of the soil types found at or within 1.5 feet of subgrade (i.e., below the pavement sections) in the borings. The poorly graded sand layers found directly below the pavement sections in Borings 1 through 8, 31 through 34, and 36, are also indicated on Figures 3A and 3B.

6.0 CONCLUSIONS

Existing Pavement Sections and Miscellaneous Aggregate Base

The existing pavement sections found in the borings on the runway were variable, with the thicknesses of the AC ranging from 3 inches to 6.5 inches. The miscellaneous aggregate base (mAB) supporting the AC on the runway varied from 8 inches to 17 inches; the thicker sections of mAB appeared to be more on the eastern end of the runway. On the connector taxiways, the borings encountered AC thicknesses of 4 to 6 inches, with the underlying mAB ranging from 3.5 inches to 12 inches.

The 4 to 8-inch layers of poorly graded sand found below Borings 1 through 8, 31 through 34, and 36, appeared to be leveling courses, and it is unclear if they were considered to be part of the overall pavement section when constructed. The material itself appeared to be beach sand.

The mAB found below the AC in all borings was not uniform and varied from clayey sand with gravel to silty sand with gravel. Comparison of the results (Appendix B) of grain size distribution tests completed on the mAB with gradation specifications for FAA P-209 material and Caltrans Class 2 aggregate base indicate that none of the four samples tested appeared to meet the gradation requirements. Therefore, for the purposes of this report, the material was classified as “miscellaneous aggregate base (mAB).”

CBR Test Results

The laboratory test results indicate variability of the CBR values of the soils based on their USCS type and on their moisture contents. The CBR test results have been summarized on Figures 4A, 4B, 5A and 5B in Appendix C, and the following paragraphs are a discussion regarding use of the data on the maps. Determinations of the actual CBR values and elastic modulus (E) values to be used in either the design for reconstruction of pavement, or the evaluation for rehabilitation of existing pavement, are to be made by the project engineer.

Per AC 150/5320-6F (FAA 2016), Chapter 2.5.3, for flexible pavements, the elastic modulus E can be estimated from CBR test results using the following correlation: E (psi) = 1500 x CBR.

Reconstructed Pavement over Existing Soils

In general, the laboratory CBR test results indicate variations in the strengths of the soils tested based on their density and their moisture content. Variations in the CBR values were noted when moisture contents were above or below optimum moisture content for most of the samples. The summary of CBR values provided in the following paragraph is based on the assumption that the subgrade soils will be recompacted within a moisture conditioned range extending from 2 percent below optimum moisture content to 2 percent above optimum moisture content. If the subgrade soils are not maintained within this range, a reduction in the CBR value will occur. Assuming the CBR values provided in this report for pavement section reconstruction will be utilized for design, the project plans should fully indicate the relatively narrow moisture content range as a specification requirement, to allow the contractor to plan earthwork operations accordingly. Provisions should also be taken (e.g., proper surface drainage and flowlines away from edges of pavement, regular maintenance of the pavement surface to fill any cracks that develop, etc.) to ensure that the moisture contents of the subgrade soils remain within the design range for the design life of the pavement sections. As noted in the "Subsurface Water and Soil Moisture Contents" Section below, edge drains should be considered to help maintain soil moisture contents following construction.

For fully reconstructed conditions, where the existing pavement sections will be removed and the underlying soils can be moisture conditioned and recompacted, the CBR values of the subgrade soils can be increased in some areas from their *in situ* conditions. However, where the existing conditions are already very well compacted, a *decrease* in the effective CBR value at that location could occur with moisture conditioning and recompaction to a lesser value than the existing conditions. The most important soil condition achieved with complete reconstruction will be uniformity of subgrade moisture and density. Per FAA AC 150/5320-6F, the degree of relative compaction required at subgrade for any pavement areas where complete reconstruction will be undertaken (and therefore the CBR value that can be used in the reconstruction design) is based on the cohesive/non-cohesive classification of the subgrade soils. With the exception of the silty sands found at or near subgrade in Borings 5, 6, 24, 28, 33, 35, 39 and 40, the soils encountered at the site are considered cohesive (plasticity index of 3 or greater, per FAA AC 150/5320-6F, Chapter 3.9.3). Also per FAA AC 150/5320-6F, cohesive soils are required to be compacted at subgrade to a minimum of 95 percent of maximum dry density. Based on discussions with the client during development of the laboratory data, given the

scattered and inconsistent nature of the silty sands, it was decided to consider all of the subgrade soils on the site as being cohesive, with a compaction standard of 95 percent of maximum dry density.

Figures 4A and 4B in Appendix C are summaries of the CBR values expected at the boring locations, based on the results of our laboratory testing and assuming the soils are compacted to a minimum of 95 percent of maximum dry density within 2 percent of optimum moisture content. After discussing the design parameters and construction considerations with the client, and reviewing the laboratory CBR test results, it is our opinion that the following "approximate average" CBR values should be used in the design of reconstructed pavements for the project:

- Runway 7-25, from Borings 11/12 to Borings 21-22 (see Figures 4A and 4B in Appendix C) – CBR = 5
- All other portions of Runway 7-25 and all Taxiway connectors – CBR = 8

Reconstructed Pavement over Lime Treated Soil

To provide better subgrade CBR values and to reduce the design section where pavement will be fully reconstructed, lime treatment can be utilized. The existing pavement sections (asphalt concrete - AC and miscellaneous aggregate base - mAB) can also be pulverized/milled in place and mixed with the subgrade, to reduce or even eliminate off-haul and disposal from demolition, and to provide a stronger subgrade material than the native soils. Milled pavement section material should be thoroughly mixed with the native soils using disks or other suitable equipment, prior to shaping to provide the design crowned subgrade section. Final mixing of the materials after shaping will be completed during the lime treatment process by pugmills. Lime treatment of the native soils mixed with milled AC/mAB material will likely provide a superior subgrade material for support of new pavement, when compared to untreated native soils, or to lime treated native soils without milled AC/mAB.

Samples of the subgrade soils only (without milled AC/mAB) from Boring 5 and Boring 27 were tested for CBR value at optimum moisture content only, with lime treatment percentages of 3, 5 and 7 percent by dry weight of soil. Based on the laboratory test results, the approximate CBR values provided in Tables 1 and 2 were determined for the samples compacted to a minimum of 95 percent of maximum dry density. If utilized, the lime treated soil layer should be 12 to 16 inches thick. A thicker section may be appropriate for areas of the site where in situ soil moisture contents are well above optimum and construction equipment traffic may cause instability. The actual thickness of lime treated soil to be utilized should be determined by the engineer.

If the existing pavement sections are milled and stockpiled for later re-use as mAB, it is anticipated that some or all of the poorly graded sand layers found in Borings 1 through 8, 31 through 34 and 36 will be removed in the process. To maintain uniformity of the subgrade soils for lime treatment, any poorly graded and/or mAB layers remaining after the milling process should be removed from the lime treatment area and properly disposed off site or reused where acceptable on site. Alternately, if the quantity of poorly graded sand and/or mAB in the lime treatment zone is significant, the additive can be switched from lime to cement. The need to make this switch should be determined based on the conditions exposed at the time of construction.

Table 1 - CBR #3 – Boring 5 at 2.0 to 4.0 Feet – Dark Brown Silty Sand – Lime Treated

Lime Treatment	Max. Density, pcf	95% Max. Dens., pcf	Approximate CBR
3 %	119.0	113.0	52
5 %	116.6	110.8	72
7 %	114.9	109.2	62

Table 2 - CBR #6 – Boring 27 at 2.0 to 4.0 Feet – Dark Brown Sandy Lean Clay – Lime Treated

Lime Treatment	Max. Density, pcf	95% Max. Dens., pcf	Approximate CBR
3 %	115.6	109.8	37
5 %	113.3	107.6	52
7 %	114.0	108.3	62

CBR Values for Existing Miscellaneous Aggregate Base (mAB)

Samples of the miscellaneous aggregate base (mAB) from four of the borings were tested for CBR in the laboratory. As discussed with the client, considering its variability, it was decided that the mAB material was not consistent enough to be able to assume with any certainty that it would be capable of being compacted to 100 percent of maximum dry density with a reasonable amount of effort. The approximate CBR values in Table 3 were determined for the four samples of mAB material compacted to a minimum of 95 percent of maximum dry density within two percent of optimum moisture content. Per AC 150/5320-6F (FAA 2016), Chapter 2.5.6.3, a *maximum* elastic modulus (E) value of 50,000 psi (CBR = 33) is recommended for the mAB material.

Table 3 – CBR Vales of Existing Misc. Aggregate Base (mAB) below Existing AC

CBR No.	Soil Type (USCS)	Found in Borings	CBR
4	Brown Clayey Sand with Gravel (SC)	1 through 8	12
15	Brown Clayey Sand with Gravel (SC)	17 through 24	27
16	Brown Silty Gravel with Sand (GM)	25 through 30	50
17	Brown Silty Sand with Gravel (SM)	9 through 16, and 31 through 40	50

Rehabilitation of Existing Pavements

Figures 5A and 5B in Appendix C show the estimated CBR values of the subgrade soils at each boring location, based on their existing density and moisture contents, and on the results of the laboratory CBR tests. Note that in 26 of the 40 borings, the existing soil moisture contents and/or densities were beyond the range of the data from the laboratory CBR tests; those locations are marked on the map with an asterisk. Where the CBR information appeared to follow a trend line beyond the data range, a rough estimate of the CBR value was provided. Where the soil moisture contents and/or density values were well out of the data range or did not appear to follow a trend line, no CBR value was provided. After reviewing the design parameters and construction considerations with the client, reviewing the laboratory CBR test results, and considering the variability of the in situ moisture and site density test results, it is our opinion that a CBR value of only 1 or 2 should be used for the subgrade in its existing condition when evaluating the potential for rehabilitation of the existing pavement.

As noted in the "Subsurface Water and Soil Moisture Contents" Section below, edge drains should be considered to help maintain soil moisture contents following construction.

Swelling Soils

AC 150/5320-6F (FAA 2016) Chapter 3.10.1 describes the effects that swelling soils have on airport pavements, and recommends various treatments (removal and replacement, stabilization, modified compaction efforts and adequate drainage) to reduce the potential for damage to pavements due to swelling soils.

Chapter 3.10.2 (FAA 2016) indicates swelling soils "usually have liquid limits above 40 and plasticity indexes above 25." Only one soil type, the brown sandy fat clay (CH) found in Boring 39 from 2.0 to 5.0 feet, meets these criteria; the test results for this material were a liquid limit of 55 and a plasticity index of 40.

Chapter 3.10.3 (FAA 2016) indicates soils with a swell of greater than 3 percent when tested for CBR require treatment to reduce the potential for damage to pavements. The following samples exhibited a swell of greater than 3 percent when tested for CBR value:

- CBR #7 – Boring 23 from 3.5 to 5.0 feet. Expansion values ranged from 3.0 to 5.8 percent after soaking for the samples compacted at 3 percent below optimum moisture content only. Samples compacted at optimum and at 3 percent above optimum exhibited expansion values of 0.5 percent or less after soaking.
- CBR #14 – Boring 39 from 2.0 to 5.0 feet. Expansion values ranged from 3.3 to 5.3 percent after soaking for the samples compacted at 3 percent below optimum moisture content only. One sample compacted at optimum moisture content experienced 3.1 percent expansion after soaking; the other two samples compacted at optimum moisture content exhibited expansion values of 2.0 percent or less. All three samples compacted at 3 percent above optimum exhibited expansion values of 2.2 percent or less after soaking.

Chapter 3.10.1 (FAA 2016) states "Local experience and judgment should be applied in dealing with swelling soils to achieve the best results." It is our understanding that the pavement at Oxnard Airport does not exhibit pervasive evidence of damage due to swelling soils, i.e., significant edge cracking or random surface unevenness. In our opinion, the material found in Boring 23 (CBR #7) from 3.5 to 5.0 feet does not exhibit enough of the characteristics to be considered a swelling soil that should be accounted for in the design process. However, the fat clay soil found in Boring 39 from 2.0 to 5.0 feet *is* considered a swelling soil, and it should be considered in the design process. This material was only found in one boring, therefore its presence on the site is likely limited.

If the engineer elects to lime treat all of the native soils for a reconstruction process, per Table 3-1 "Recommended Treatment of Swelling Soils" (FAA 2016), the lime treatment will neutralize the swelling soils, and no additional action would be necessary. If reconstruction is planned *without* lime treatment, the most reasonable course of action, again per Table 3-1 "Recommended Treatment of Swelling Soils" (FAA 2016), would probably be to remove the fat clay soils to a depth of at least 36 inches below the pavement section and replace with non-swelling soil. If the

existing pavements are rehabilitated without reconstruction, the only option available to reduce the potential for damage would be to provide adequate surface and subsurface drainage, as described in the "Subsurface Water and Soil Moisture Contents" Section below, where the fat clay soils are present in the subgrade.

Earthwork Shrinkage

Soil volume loss, or "shrinkage", during earthwork can be attributed to three categories; soil loss due to stripping or demolition of existing improvements, subsidence of the underlying soils due to compaction, and shrinkage of fill soil as it is placed and compacted. These factors are partly due to the soil characteristics, but largely due to depths of cuts and fills, stripping techniques, type and weight of earthwork equipment, traffic pattern of earthwork equipment, and soil moisture at the time of grading.

In paved areas that are to be reconstructed, removal of distinct AC and AB layers can result in less loss than from removal of vegetation in unpaved areas, if any. The amount of soil loss that will occur is largely dependent upon how careful the contractor is in stripping and demolition/removal operations.

Subsidence of the site due to compaction of the soils below a fill area also occurs. Subsidence due to compaction is likely to be in the range of 0.1 to 0.2 feet. The main zone of subsidence is typically the upper two to three feet. Deeper subsidence is not expected as earthwork operations for pavement reconstruction are expected to be limited to the upper 1 to 2 feet in the project area.

To estimate shrinkage of the subgrade, *in situ* soil density data from ring samples taken in the borings at approximate subgrade elevation were analyzed. Appendix D contains a summary of the existing relative compaction at each depth where a ring sample was secured, as well as calculated shrinkage assuming final relative compaction values ranging from 95 to 100 percent.

As loss, subsidence, and shrinkage are only partly due to the soil characteristics, and are largely influenced by the earthwork equipment, earthwork methods, and soil moisture, these factors cannot be precisely estimated.

Subsurface Water and Soil Moisture Contents

Subsurface water was not encountered in any of the borings to the maximum depth drilled of 10 feet below the existing pavement surface. However, caliche deposits, a residual mineral in the

soil indicating the past presence of subsurface water, were found at various depths in 32 of the 40 borings drilled for this project. Caliche is an indicator that significant soil moisture contents have been present in the past. If soil moisture contents are well above optimum in pavement areas to be reconstructed, the soils could become unstable under equipment traffic. Unstable conditions hinder compaction efforts and are not acceptable to support fill or pavement section placement. All grading areas should be firm and unyielding following compaction operations and prior to placement of fill, aggregate base or pavement.

Depending on the time of year that construction operations take place, the most effective methods to deal with unstable conditions due to high soil moisture could be scarification and aeration, or the use of geotextile stabilization fabrics. Scarification and aeration may only be possible if the weather conditions are clear and if the project schedule permits.

If the project schedule will not allow drying of the soil naturally, stabilization fabric could be utilized. Additional excavation below subgrade may also be needed before the stabilization fabric is placed; the depth of overexcavation should be determined by the geotechnical engineer based on conditions exposed at the time of construction. After all excavations are complete, and prior to placement of the geotextiles, the exposed surfaces are typically back-dragged to a smooth condition to the degree practicable with light earthwork equipment. Geotextile stabilization fabric (Mirafi RS380i or similar material depending on the degree of instability) is typically placed in the excavated area and extended up the sidewalls of the excavation to within 2 inches of the bottom of the AC layer. Stabilization fabrics are rolled out along the long dimension of the reconstruction area (not perpendicular to it), and are stretched, overlapped and held in place according to the manufacturer's recommendations. Recycled subbase and/or imported aggregate base, per the overall pavement section design, is placed over the fabric in thin, moisture-conditioned lifts and compacted. Recycled subbase and/or aggregate base is placed by end-dumping on the fabric and spreading ahead of equipment; equipment traffic is typically not allowed to travel directly over the fabric. Initial lifts of subbase/base are spread and compacted by rubber-tired equipment; subsequent lifts are compacted using sheepsfoot and/or steel-drum equipment. Compaction equipment is usually operated in static mode only until base grade is reached, to reduce the potential for any free water in the underlying soils to be drawn through the fabric and into the subbase or aggregate base.

If it appears that stable conditions will not be created at base grade after the use of geotextiles, a layer of geogrid (Tensar TriAx TX-7 or similar material) can be placed according to the

manufacturer's recommendations as additional reinforcement at the approximate mid-depth of the subbase/aggregate base layer. Often sufficient material may not be in place over the geotextile stabilization fabric at mid-depth of the design subbase/aggregate base layer to fully mobilize its strength characteristics and to determine if geogrid will be needed, therefore it may be necessary to construct a full-scale test strip of the pavement section, with and without geogrid reinforcement. This test strip will give an indication as to whether or not geogrids will be required in any reconstruction areas.

Figures 6A and 6B – Subgrade Soil Moisture Content in Appendix C show the soil moisture contents at the time of our field exploration, and percentage above (or below) optimum moisture content. These data show that in the majority of the boring locations, soil moisture contents were above optimum moisture content, with some in excess of 10 percent above optimum. As noted in the "CBR Test Results" Section of this report, the CBR values decrease significantly with increasing soil moisture contents. To reduce the potential for accumulated moisture in the subgrade and the subsequent loss of soil strength (CBR value), positive surface drainage away from all paved areas must be provided. Edge drains adjacent to the pavement areas are also recommended. The drains could consist of conventional geotextile-wrapped and gravel-filled trenches with perforated collection pipes, or prefabricated panel-type drainage systems that are placed in narrow trenches. The 3- to 4-inch diameter perforated collection pipes in conventional trenches have the advantage of being able to be fitted with cleanouts for system maintenance; however, this could be outweighed by the relatively low cost of a thin panel drain system, as gravel drains require excavation of wider trenches, trench spoil disposal, and gravel placement. The actual type of system to be utilized, if any, should be determined by the engineer. The drains should be placed, wherever practicable, to dewater the upper 2 to 3 feet of soil below the pavement sections.

Soil Erodibility

The site soils are considered to be erodible. It is essential that all surface drainage be controlled and directed to appropriate discharge points, and that surface soils, particularly those disturbed during construction, are stabilized by vegetation or other means during and following construction.

7.0 OBSERVATION AND TESTING

1. It must be recognized that the recommendations contained in this report are based on a limited number of borings and rely on continuity of the subsurface conditions

encountered. Therefore, the geotechnical engineer should be retained to provide consultation during the design phase, to review plans as they near completion, to interpret this report during construction, and to provide construction monitoring in the form of testing and observation.

2. At a minimum, the following should be provided by the geotechnical engineer during construction:

   - Professional observation during grading
   - Oversight of special inspection during grading

3. Special inspection of grading should be provided as per the requirements of the FAA or Section 1705.6 and Table 1705.6 of the CBC; the soils special inspector should be under the direction of the geotechnical engineer. Subject to approval by the building official or other jurisdiction, special inspection requirements should be addressed by the geotechnical engineer during the preconstruction meeting (see below) prior to the start of grading operations.

   At a minimum, the following items should be inspected and/or tested by the special inspector:

   - Stripping and clearing of vegetation and existing pavement where planned for removal
   - Excavations to subgrade in any pavement reconstruction areas, and corrective operations (scarification/aeration or placement of geotextile stabilization fabric) in any unstable areas
   - Excavations to subgrade in any pavement reconstruction areas and scarification, moisture conditioning, and recompaction in stable areas
   - Fill, milled/pulverized AC (if any) and imported aggregate base quality, placement, moisture conditioning, and compaction
   - Utility trench backfill

4. A program of quality control should be developed prior to beginning grading. The contractor or project manager should determine any additional inspection items required by the architect/engineer or the governing jurisdiction.

5. Locations and frequency of compaction tests should be as per the recommendation of the geotechnical engineer at the time of construction. The recommended test location and frequency may be subject to modification by the geotechnical engineer, based upon soil and moisture conditions encountered, size and type of equipment used by the contractor, the general trend of the results of compaction tests, or other factors.

6. A preconstruction conference among the owner, the geotechnical engineer, the governing agency, the special inspector, the project inspector, the architect/engineer, and contractors is recommended to discuss planned construction procedures and quality control requirements.

7. The geotechnical engineer should be notified at least 48 hours prior to beginning construction operations. If Earth Systems Pacific is not retained to provide construction observation and testing services, it shall not be responsible for the interpretation of the information by others or any consequences arising therefrom.

8.0 CLOSURE

Our intent was to perform the investigation in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the locality of this project and under similar conditions. No representation, warranty, or guarantee is either expressed or implied. This report is intended for the exclusive use by the client as discussed in the "Scope of Services" section. Application beyond the stated intent is strictly at the user's risk.

This report is valid for conditions as they exist at this time for the type of project described herein. The conclusions and recommendations contained in this report could be rendered invalid, either in whole or in part, due to changes in building codes, FAA regulations, standards of geotechnical or construction practice, changes in physical conditions, or the broadening of knowledge.

If changes with respect to development type or location become necessary, if items not addressed in this report are incorporated into plans, or if any of the assumptions used in the preparation of this report are not correct, this firm shall be notified for modifications to this report. Any items not specifically addressed in this report should comply with the FAA, the CBC and/or the requirements of the governing jurisdiction.

The preliminary recommendations of this report are based upon the geotechnical conditions encountered at the site and may be augmented by additional requirements of the engineer, or

by additional recommendations provided by this firm based on conditions exposed at the time of construction.

This document, the data, conclusions, and recommendations contained herein are the property of Earth Systems Pacific. This report shall be used in its entirety, with no individual sections reproduced or used out of context. Copies may be made only by Earth Systems Pacific, the client, and the client's authorized agents for use exclusively on the subject project. Any other use is subject to federal copyright laws and the written approval of Earth Systems Pacific.

Thank you for this opportunity to have been of service. If you have any questions, please feel free to contact this office at your convenience.

End of Text.

TECHNICAL REFERENCES

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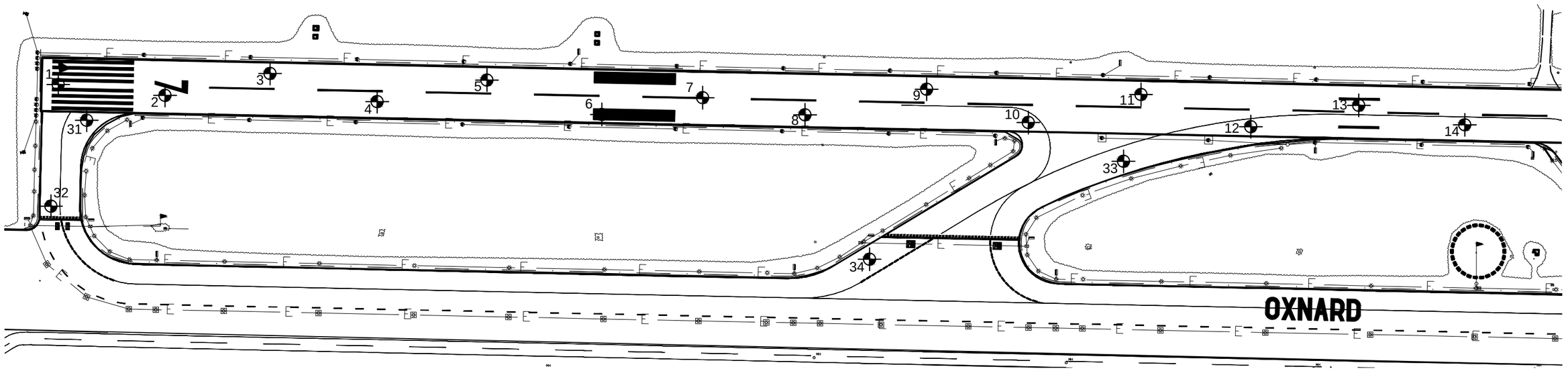
APPENDIX A

Figures 1a and 1b – Exploration Location Maps

Table 1 - Boring Locations by Latitude and Longitude

Boring Log Legend

Boring Logs



LEGEND

40 Boring Location (Approx.)

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

N

NOT TO SCALE

Earth Systems Pacific
4378 Old Santa Fe Road, San Luis Obispo, CA 93401
www.earthsystems.com
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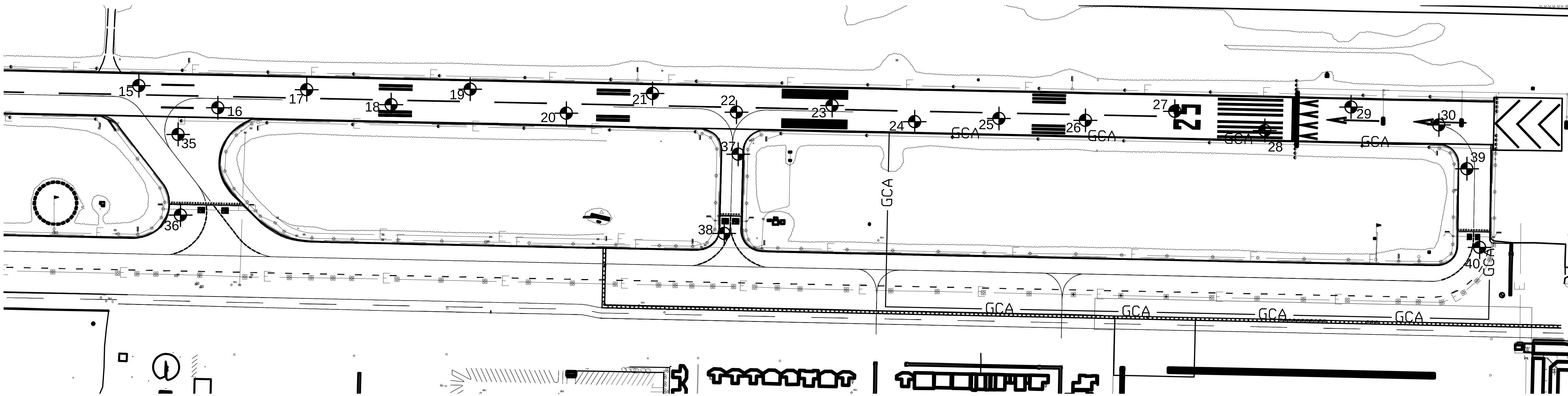
FIGURE 1A - EXPLORATION LOCATION MAP

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

Project No.
302524-001

OXNARDAIRPORT110518mxps



NOT TO SCALE

LEGEND

40 Boring Location (Approx.)

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

Earth Systems Pacific
4378 Old Santa Fe Road, San Luis Obispo, CA 93401
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FIGURE 1B - EXPLORATION LOCATION MAP
Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

Project No.
302524-001

Sheet 2 of 2

OXNARDAIRPORT110518maps

BORING LOCATIONS BY LATITUDE AND LONGITUDE

Boring No.	Latitude	Longitude
1	34.20089	-119.21698
2	34.20090	-119.21639
3	34.20094	-119.21567
4	34.20078	-119.21501
5	34.20091	-119.21436
6	34.20079	-119.21373
7	34.20087	-119.21302
8	34.20077	-119.21245
9	34.20088	-119.21170
10	34.20071	-119.21107
11	34.20092	-119.21040
12	34.20075	-119.20971
13	34.20086	-119.20908
14	34.20677	-119.20847
15	34.20087	-119.20775
16	34.20081	-119.20710
17	34.20082	-119.20640
18	34.20079	-119.20576
19	34.20091	-119.20508
20	34.20077	-119.20449
21	34.20087	-119.20377
22	34.20075	-119.20392
23	34.20084	-119.20245
24	34.20074	-119.20182
25	34.20076	-119.20116
26	34.20076	-119.20049
27	34.20081	-119.19983
28	34.20072	-119.19908
29	34.20082	-119.19847
30	34.20075	-119.19784
31	34.20070	-119.21687
32	34.20026	-119.21700
33	34.20058	-119.21054
34	34.20005	-119.21200
35	34.20053	-119.20737
36	34.19999	-119.20740
37	34.20053	-119.20316
38	34.20002	-119.20325
39	34.20045	-119.19760
40	34.19996	-119.19747

Earth Systems Pacific

BORING LOG LEGEND

SAMPLE / SUBSURFACE WATER SYMBOLS	GRAPH. SYMBOL
CALIFORNIA MODIFIED	
STANDARD PENETRATION TEST (SPT)	
SHELBY TUBE	
BULK	
SUBSURFACE WATER DURING DRILLING	
SUBSURFACE WATER AFTER DRILLING	

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

MAJOR DIVISIONS	GROUP SYMBOL	TYPICAL DESCRIPTIONS	GRAPH. SYMBOL
COARSE GRAINED SOILS (MORE THAN HALF OF MATERIAL IS LARGER THAN #200 SIEVE SIZE)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
	GP	POORLY GRADED GRAVELS, OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, NON-PLASTIC FINES	
	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, PLASTIC FINES	
	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	
	SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES	
	SM	SILTY SANDS, SAND-SILT MIXTURES, NON-PLASTIC FINES	
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES, PLASTIC FINES	
FINE GRAINED SOILS (HALF OR MORE OF MATERIAL IS SMALLER THAN #200 SIEVE SIZE)	ML	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS	
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
	PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	

OBSERVED MOISTURE CONDITION

DRY	SLIGHTLY MOIST	MOIST	VERY MOIST	WET (SATURATED)

CONSISTENCY

COARSE GRAINED SOILS			FINE GRAINED SOILS		
BLOWS/FOOT		DESCRIPTIVE TERM	BLOWS/FOOT		DESCRIPTIVE TERM
SPT	CA SAMPLER		SPT	CA SAMPLER	
0-10	0-16	LOOSE	0-2	0-3	VERY SOFT
11-30	17-50	MEDIUM DENSE	3-4	4-7	SOFT
31-50	51-83	DENSE	5-8	8-13	MEDIUM STIFF
OVER 50	OVER 83	VERY DENSE	9-15	14-25	STIFF
			16-30	26-50	VERY STIFF
			OVER 30	OVER 50	HARD

GRAIN SIZES

U.S. STANDARD SERIES SIEVE				CLEAR SQUARE SIEVE OPENING		
# 200	# 40	# 10	# 4	3/4"	3"	12"

SILT & CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

TYPICAL BEDROCK HARDNESS

MAJOR DIVISIONS	TYPICAL DESCRIPTIONS
EXTREMELY HARD	CORE, FRAGMENT, OR EXPOSURE CANNOT BE SCRATCHED WITH KNIFE OR SHARP PICK; CAN ONLY BE CHIPPED WITH REPEATED HEAVY HAMMER BLOWS
VERY HARD	CANNOT BE SCRATCHED WITH KNIFE OR SHARP PICK; CORE OR FRAGMENT BREAKS WITH REPEATED HEAVY HAMMER BLOWS
HARD	CAN BE SCRATCHED WITH KNIFE OR SHARP PICK WITH DIFFICULTY (HEAVY PRESSURE); HEAVY HAMMER BLOW REQUIRED TO BREAK SPECIMEN
MODERATELY HARD	CAN BE GROOVED 1/16 INCH DEEP BY KNIFE OR SHARP PICK WITH MODERATE OR HEAVY PRESSURE; CORE OR FRAGMENT BREAKS WITH LIGHT HAMMER BLOW OR HEAVY MANUAL PRESSURE
SOFT	CAN BE GROOVED OR GOUGED EASILY BY KNIFE OR SHARP PICK WITH LIGHT PRESSURE, CAN BE SCRATCHED WITH FINGERNAIL; BREAKS WITH LIGHT TO MODERATE MANUAL PRESSURE
VERY SOFT	CAN BE READILY INDENTED, GROOVED OR GOUGED WITH FINGERNAIL, OR CARVED WITH KNIFE; BREAKS WITH LIGHT MANUAL PRESSURE

TYPICAL BEDROCK WEATHERING

MAJOR DIVISIONS	TYPICAL DESCRIPTIONS
UNWEATHERED	NO DISCOLORATION, NOT OXIDIZED
SLIGHTLY WEATHERED	DISCOLORATION OR OXIDATION IS LIMITED TO SURFACE OF, OR SHORT DISTANCE FROM, FRACTURES: SOME FELDSPAR CRYSTALS ARE DULL
MODERATELY WEATHERED	DISCOLORATION OR OXIDATION EXTENDS FROM FRACTURES, USUALLY THROUGHOUT; Fe-Mg MINERALS ARE "RUSTY", FELDSPAR CRYSTALS ARE "CLOUDY"
HIGHLY WEATHERED	DISCOLORATION OR OXIDATION THROUGHOUT; FELDSPAR AND Fe-Mg MINERALS ARE ALTERED TO CLAY TO SOME EXTENT, OR CHEMICAL ALTERATION PRODUCES IN SITU DISAGGREGATION
DECOMPOSED	DISCOLORATION OR OXIDATION THROUGHOUT, BUT RESISTANT MINERALS SUCH AS QUARTZ MAY BE UNALTERED; FELDSPAR AND Fe-Mg MINERALS ARE COMPLETELY ALTERED TO CLAY

drafting/masters/Boring Log Legend 062719.dwg

Earth Systems Pacific

Boring No. 1

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 11/1/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		4" AC over 9" Brown CLAYEY SAND with GRAVEL (misc. AB)					
1	SP	+/- 4" POORLY GRADED SAND: brown, medium dense, moist (Fill)	0.5 - 1.0	○			6 9 10
2	CL	SANDY LEAN CLAY: dark brown, stiff, moist	1.0 - 2.5	■	119.4	13.4	
3							
4			2.0 - 5.0	○			3 2 2
5			5.0 - 6.5	●			
6	CL	SANDY LEAN CLAY: brown, soft, moist (Alluvium)					
7							
8	ML	SILT: brown, very soft, moist, trace caliche					0 0 2
9			8.5 - 10.0	●			
10		End of Boring @ 10.0'					
11		No subsurface water encountered					
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 2

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 11/1/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		4.5" AC over 10" Brown CLAYEY SAND with GRAVEL (misc. AB)					
1	SP	+/- 8" POORLY GRADED SAND: brown, loose, moist (Fill)	0.5 - 1.0	○			
2	CL	SANDY LEAN CLAY: dark brown, very stiff, moist	1.5-3.0	■	121.1	13.8	6 13 16
3							
4			2.0 - 4.0	○			
5	CL	SANDY LEAN CLAY: brown, soft, moist (Alluvium)	5.0 - 6.5	●			3 2 2
6							
7							
8							0
9			8.5 - 10.0	●			1 2
10		End of Boring @ 10.0'					
11		No subsurface water encountered					
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 3

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

PAGE 1 OF 1
JOB NO.: 302524-001
DATE: 11/1/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			3.5" AC over 12" Brown CLAYEY SAND with GRAVEL (misc. AB)					
1	SP		+/- 6" POORLY GRADED SAND: brown, loose, moist (Fill)	0.5 - 1.5	○			6
2	CL		SANDY LEAN CLAY: dark brown, very stiff, moist	1.5 - 3.0	■	116.9	14.2	12
3								16
4	CL		SANDY LEAN CLAY: brown, soft, moist (Alluvium)	2.0 - 4.0	○			2
5				5.0 - 6.5	●			1
6								2
7	ML		SILT: brown, very soft, moist					
8								1
9				8.5 - 10.0	●			1
10								1
11			End of Boring @ 10.0' No subsurface water encountered					
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 4

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

PAGE 1 OF 1
JOB NO.: 302524-001
DATE: 11/1/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			3" AC over 14" Brown CLAYEY SAND with GRAVEL (misc. AB)					
1	SP		+/- 4" POORLY GRADED SAND: brown, loose, moist (Fill)					
2	CL		SANDY LEAN CLAY: dark brown, stiff, very moist	1.5 - 3.0	■	116.2	16.1	5 8 9
3				2.0 - 5.0	○			
4								1
5	CL		SANDY LEAN CLAY: brown, soft, moist (Alluvium)	5.0 - 6.5	●			1 2
6								
7								
8								0
9				8.5 - 10.0	●			1 2
10			End of Boring @ 10.0'					
11			No subsurface water encountered					
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 5

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 11/1/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		4.5" AC over 12" Brown CLAYEY SAND with GRAVEL (misc. AB)					
1	SP	+/- 4" POORLY GRADED SAND: brown, loose, moist (Fill)	0.5 - 1.5	○			4
2	SM	SILTY SAND: dark brown, medium dense, moist	1.5 - 3.0	■	118.3	14.5	12
3							12
4	CL	SANDY LEAN CLAY: brown, very soft, moist, trace caliche deposits (Alluvium)	2.0 - 4.0	○			1
5			5.0 - 6.5	●			1
6							1
7							
8							0
9		very moist, trace clay	8.5 - 10.0	●			1
10							1
11		End of Boring @ 10.0'					
12		No subsurface water encountered					
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 6

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

PAGE 1 OF 1
JOB NO.: 302524-001
DATE: 11/1/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4" AC over 12" Brown CLAYEY SAND with GRAVEL (misc. AB)					
1	SP		+/- 4" POORLY GRADED SAND: brown, loose, moist (Fill)	1.5 - 3.5	○			
2	SM							7
3			SILTY SAND: dark brown, medium dense, moist	1.5 - 3.0	■	121.5	13.3	9 10
4								
5	CL		SANDY LEAN CLAY: brown to light brown, soft, moist, trace caliche deposits (Alluvium)	5.0 - 6.5	●			1 1 2
6								
7								
8								0
9			gray/brown mottled, very soft, trace clay	8.5 - 10.0	●			1 1
10								
11			End of Boring @ 10.0'					
12			No subsurface water encountered					
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 7

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

PAGE 1 OF 1
JOB NO.: 302524-001
DATE: 11/1/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			6" AC over 12" Brown CLAYEY SAND with GRAVEL (misc. AB)					
1	SP		+/- 4" POORLY GRADED SAND: brown, loose, moist (Fill)	0.5 - 1.5	○			8
2	CL							11
3			SANDY LEAN CLAY: dark brown, very stiff, moist	1.0 - 2.5	■	121.9	13.3	9
4				2.0 - 3.5	○			
5	CL		SANDY LEAN CLAY: brown, soft, moist, (Alluvium)	5.0 - 6.5	●			0 1 2
6								
7								
8								0
9			very soft	8.5 - 10.0	●			0 1
10								
11			End of Boring @ 10.0'					
12			No subsurface water encountered					
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 8

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

PAGE 1 OF 1
JOB NO.: 302524-001
DATE: 10/31/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			6.5" AC over 12" Brown CLAYEY SAND with GRAVEL (misc. AB)					
2	SP		+/- 4" POORLY GRADED SAND: brown, loose, moist (Fill)					13
2	CL		SANDY LEAN CLAY: dark brown, stiff, slightly moist	1.0 - 2.5	■	118.1	4.7	15
3	CL							9
4			SANDY LEAN CLAY: brown, very soft, moist, trace caliche (Alluvium)	2.0 - 5.0	○			
5								0
5				5.0 - 6.5	●			1
6								1
8								0
8				8.5 - 10.0	●			2
9			brown/gray mottled, soft, very moist, trace clay					1
10			End of Boring @ 10.0'					
			No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 9

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/31/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4" AC over 11" Brown SILTY SAND with GRAVEL (misc. AB)	0.5 - 1.5	○			7
1				1.5 - 3.0	■	102.6	19.7	5
2	CL		SANDY LEAN CLAY: dark brown, medium stiff, very moist (Fill)	1.5 - 3.0	○			6
3				3.0 - 5.0	○			
4	CL		SANDY LEAN CLAY: brown, medium stiff, moist, caliche deposits (Alluvium)					
5			very soft	5.0 - 6.5	●			0 1 1
6			gray/brown mottled					
7								
8								0
9				8.5 - 10.0	●			0 2
10			End of Boring @ 10.0' No subsurface water encountered					
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 10

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/31/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			10" AC over 8" Brown SILTY SAND with GRAVEL (misc. AB)	0.5 - 1.5	○			5
2	CL		SANDY LEAN CLAY: dark brown, stiff, moist (Fill)	1.5 - 3.0	■	115.0	13.6	10
				1.5 - 2.5	○			11
3	CL		LEAN CLAY: brown, soft, moist (Alluvium)	2.5 - 4.0	○			
5			caliche deposits	5.0 - 6.5	●			1 2 2
9			gray/brown mottled, very soft, very moist	8.5 - 10.0	●			0 1 1
10			End of Boring @ 10.0' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 11

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/31/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4.5" AC over 12" Brown SILTY SAND with GRAVEL (misc. AB)					
1								4
2	CL		SANDY LEAN CLAY: dark brown, stiff, moist (Fill)	1.5 - 3.0	■	104.0	21.5	6
3				2.0 - 4.0	○			8
4	CL		SANDY LEAN CLAY: brown/light brown mottled, very soft, moist, caliche deposits (Alluvium)					0
5				5.0 - 6.5	●			0
6								1
7								
8								0
9			very moist, trace clay	8.5 - 10.0	●			1
10								0
11			End of Boring @ 10.0'					
12			No subsurface water encountered					
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 12

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

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JOB NO.: 302524-001
DATE: 10/31/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4" AC over 16" Brown SILTY SAND with GRAVEL (misc. AB)	0.5 - 1.5	Grab			3
1				1.5 - 3.0	Ring	95.5	24.8	7
2	CL		SANDY LEAN CLAY: dark brown, stiff, moist, trace caliche (Fill)	2.0 - 4.0	Grab			9
3								
4	CL		SANDY LEAN CLAY: brown/light brown mottled, soft, moist (Alluvium)					0
5				5.0 - 6.5	SPT			2
6								2
7								
8								1
9			brown/gray mottled, very soft, very moist	8.5 - 10.0	SPT			1
10								1
11			End of Boring @ 10.0' No subsurface water encountered					
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 13

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/31/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			5" AC over 14" brown SILTY SAND with GRAVEL (misc. AB)					
1								5
2	CL		SANDY LEAN CLAY: dark brown, stiff, very moist (Fill)	1.5 - 3.0	■	101.2	22.0	7
3				2.0 - 4.0	○			12
4	CL		SANDY LEAN CLAY: brown/light brown mottled, soft, moist (Alluvium)					1
5				5.0 - 6.5	●			1
6								2
7								
8								1
9			very soft	8.5 - 10.0	●			1
10								1
11			End of Boring @ 10.0'					
12			No subsurface water encountered					
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 14

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/31/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4.5" AC over 12" brown SILTY SAND with GRAVEL (misc. AB)	0.5 - 1.5	Grab			3
1				1.5 - 3.0	Ring	102.5	22.0	6
2	CL		SANDY LEAN CLAY: dark brown, stiff, very moist (Fill)	2.0 - 5.0	Grab			10
3								
4								1
5	CL		SANDY LEAN CLAY: brown/light brown mottled, soft, moist, trace clay (Alluvium)	5.0 - 6.5	SPT			1
6								2
7								
8								1
9			medium stiff	8.5 - 10.0	SPT			2
10								3
11			End of Boring @ 10.0'					
12			No subsurface water encountered					
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 15

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

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JOB NO.: 302524-001
DATE: 10/30/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4" AC over 15" brown SILTY SAND with GRAVEL (misc. AB)					
1								4
2	CL		SANDY LEAN CLAY: dark brown, stiff, very moist (Fill)	1.5 - 3.0	■	100.1	23.4	7
3			caliche deposits	2.0 - 4.0	○			11
4								
5	CL		SANDY LEAN CLAY: brown/light brown mottled, very soft, moist (Alluvium)	5.0 - 6.5	●			1
6								1
7								
8								1
9			soft	8.5 - 10.0	●			1
10								2
11			End of Boring @ 10.0'					
12			No subsurface water encountered					
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 16

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/30/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4" AC over 14" brown SILTY SAND with GRAVEL (misc. AB)					
1								4
2	CL		SANDY LEAN CLAY: dark brown, stiff, very moist (Fill)	1.5 - 3.0	■	109.3	19.0	7
3				2.0 - 4.0	○			9
4								
5	CL		SANDY LEAN CLAY: brown, medium stiff, moist, trace caliche deposits (Alluvium)	5.0 - 6.5	●			1 3 4
6								
7								
8								1
9			soft	8.5 - 10.0	●			1 2
10			End of Boring @ 10.0'					
11			No subsurface water encountered					
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 17

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/30/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4.5" AC over 13" brown CLAYEY SAND with GRAVEL (misc. AB)	0.5 - 1.5	Grab			3
1				1.5 - 3.0	Ring	104.8	20.8	5
2	CL		SANDY LEAN CLAY: dark brown, stiff, very moist (Fill)	3.0 - 5.0	Grab			9
3	CL		SANDY LEAN CLAY: dark brown, medium stiff, moist (Alluvium)					
4								
5			brown, soft	5.0 - 6.5	SPT			1
6								1
7								2
8								0
9			gray/brown mottled, medium stiff	8.5 - 10.0	SPT			2
10								4
11			End of Boring @ 10.0'					
12			No subsurface water encountered					
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 18

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/30/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4" AC over 13" brown CLAYEY SAND with GRAVEL (misc. AB)					2
1								4
2	CL		SANDY LEAN CLAY: dark brown, medium stiff, very moist (Fill)	1.5 - 3.0	■	103.2	20.1	7
3	CL		SANDY LEAN CLAY: dark brown, medium stiff, moist (Alluvium)	2.5 - 5.0	○			
4								1
5			soft, caliche deposits	5.0 - 6.5	●			1
6								2
7								
8								2
9			gray/brown mottled, medium stiff	8.5 - 10.0	●			3
10								3
11			End of Boring @ 10.0'					
12			No subsurface water encountered					
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 19

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/30/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4" AC over 13" brown CLAYEY SAND with GRAVEL (misc. AB)	0.5 - 1.5	Grab			5
1				1.5 - 3.0	Ring	113.4	16.9	8
2	CL		SANDY LEAN CLAY: dark brown, stiff, very moist (Fill)	1.5 - 3.5	Grab			11
3								
4	CL		SANDY LEAN CLAY: brown, soft, moist, caliche deposits (Alluvium)					1
5				5.0 - 6.5	SPT			1
6								3
7								
8								0
9			light brown, very soft	8.5 - 10.0	SPT			1
10								1
11			End of Boring @ 10.0' No subsurface water encountered					
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 20

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/30/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4" AC over 13" brown CLAYEY SAND with GRAVEL (misc. AB)					
1								3
2	CL		SANDY LEAN CLAY: dark brown, stiff, very moist (Fill)	1.5 - 3.0	■	111.7	17.6	8
3	CL		SANDY LEAN CLAY: brown, soft, moist (Alluvium)					11
4				3.0 - 6.0	○			
5			caliche deposits	5.0 - 6.5	●			0
6								1
7								2
8								1
9			gray/brown mottled	8.5 - 10.0	●			2
10								3
11			End of Boring @ 10.0' No subsurface water encountered					
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 21

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/30/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			3" AC over 13" brown CLAYEY SAND with GRAVEL (misc. AB)	0.5 - 1.5	Grab			4
1				1.5 - 3.0	Ring	119.5	13.9	9
2	CL		SANDY LEAN CLAY: dark brown, stiff, moist (Fill)	1.5 - 3.0	Grab			15
3	CL		SANDY LEAN CLAY: brown, very soft, moist, caliche deposits (Alluvium)					
4								0
5				5.0 - 6.5	SPT			1
6								1
7								
8								1
9			gray/brown mottled, medium stiff	8.5 - 10.0	SPT			2
10								3
11			End of Boring @ 10.0' No subsurface water encountered					
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ◯ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 22

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/29/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4.5" AC over 16" brown CLAYEY SAND with GRAVEL (misc. AB)					
2	CL		SANDY LEAN CLAY: dark brown, stiff, very moist (Fill)	2.0 - 3.5	■	114.0	17.6	4, 7, 10
				2.0 - 4.0	○			
4			brown					
5	CL		SANDY LEAN CLAY: brown, soft, moist, caliche deposits (Alluvium)	5.0 - 6.5	●			1, 1, 2
9			gray/brown mottled, medium stiff	8.5 - 10.0	●			1, 2, 3
10			End of Boring @ 10.0' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 23

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/29/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			6" AC over 13" brown CLAYEY SAND with GRAVEL (misc. AB)	0.5 - 1.5	○			9
1				1.5 - 3.0	■	118.5	13.8	12
2	CL		SANDY LEAN CLAY: dark brown, stiff, moist (Fill)	1.5 - 3.5	○			12
3				3.5 - 5.0	○			
4	CL		SANDY LEAN CLAY: brown, medium stiff, moist (Alluvium)					1
5			soft	5.0 - 6.5	●			1
6			light brown					2
7								
8								1
9			gray/brown mottled, medium stiff, caliche deposits	8.5 - 10.0	●			2
10								4
11			End of Boring @ 10.0' No subsurface water encountered					
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 24

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/29/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			5" AC over 12" brown CLAYEY SAND with GRAVEL (misc. AB)					
1								7
2	SM		SILTY SAND: yellow brown, medium dense, moist, trace gravel (Fill)	1.5 - 3.0	■	107.2	5.6	10
3				1.5 - 3.5	○			10
4	CL		SANDY LEAN CLAY: brown, soft, moist, caliche deposits (Alluvium)					
5				5.0 - 6.5	●			1 2 2
6								
7								
8								0
9				8.5 - 10.0	●			1 2
10			End of Boring @ 10.0'					
11			No subsurface water encountered					
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 25

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/28/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			5" AC over 14" brown SILTY GRAVEL with SAND (misc. AB)	0.5 - 1.5	○			4
1				1.5 - 3.0	■	106.3	19.0	6
2	CL		SANDY LEAN CLAY: dark brown, medium stiff, very moist (Fill)					7
3	CL		SANDY LEAN CLAY: brown, soft, moist, caliche deposits (Alluvium)	3.0 - 5.0	○			
4								0
5				5.0 - 6.5	●			2
6	SM		SILTY SAND: brown, loose, moist					2
7								
8	ML		SILT: brown, very soft, very moist, trace clay					0
9				8.5 - 10.0	●			0
10								1
11			End of Boring @ 10.0' No subsurface water encountered					
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 26

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

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JOB NO.: 302524-001
DATE: 10/28/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			5" AC over 15" brown SILTY GRAVEL with SAND (misc. AB)	0.5 - 1.5	○			
2	CL		LEAN CLAY: gray brown, stiff, very moist (Fill)	2.0 - 3.5	▬	110.1	17.1	4 6 9
3				2.0 - 4.0	○			
4				4.0 - 6.0	○			
5	CL		SANDY LEAN CLAY: brown, soft, moist (Alluvium)	5.0 - 6.5	●			1 2 2
8			very soft, caliche deposits	8.5 - 10.0	●			0 1 1
10			End of Boring @ 10.0' No subsurface water encountered					

LEGEND: ▬ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 27

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/28/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			5.5" AC over 16" brown SILTY GRAVEL with SAND (misc. AB)	0.5 - 1.5	○			
2	CL		SANDY LEAN CLAY: dark brown, stiff, very moist (Fill)	2.0 - 3.5	■	97.4	20.8	5 7 7
				2.0 - 4.0	○			
5	CL		SANDY LEAN CLAY: brown, soft, moist, caliche deposits (Alluvium)	5.0 - 6.5	●			1 1 2
8			medium stiff	8.5 - 10.0	●			0 2 3
10			End of Boring @ 10.0' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 28

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/28/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		3" AC over 17" brown SILTY GRAVEL with SAND (misc. AB)	0.5 - 1.5	○			8
2	SM	SILTY SAND: brown, medium dense, slightly moist, trace gravel (Fill)	1.5 - 3.0	■	122.5	4.9	11
3			2.0 - 4.0	○			11
4	CL	SANDY LEAN CLAY: brown, medium stiff, moist, caliche deposits (Alluvium)					1
5			5.0 - 6.5	●			1
6		very soft					1
8		very moist	8.5 - 10.0	●			0
9							0
10							1
11		End of Boring @ 10.0' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 29

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/28/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			5.5" AC over 14" brown SILTY GRAVEL with SAND (misc. AB)	0.5 - 1.5	○			5
2	CL		SANDY LEAN CLAY: brown/gray mottled, stiff, moist (Fill)	1.5 - 3.0	■	112.5	15.3	10
3				2.0 - 5.0	○			10
5	CL		SANDY LEAN CLAY: brown, soft, moist, caliche deposits (Alluvium)	5.0 - 6.5	●			1
8			medium stiff	8.5 - 10.0	●			0
9								2
								3
10			End of Boring @ 10.0' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 30

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/28/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4" AC over 14" brown SILTY GRAVEL with SAND (misc. AB)	0.5 - 1.5	○			
2	CL		SANDY LEAN CLAY: dark brown, stiff, moist (Fill)	1.5 - 3.0	■	112.2	14.7	6 7 9
3				2.0 - 5.0	○			
5	CL		SANDY LEAN CLAY: brown, soft, moist, caliche deposits (Alluvium)	5.0 - 6.5	●			0 1 2
8	ML		SILT: gray/brown mottled, medium stiff, moist, caliche deposits	8.5 - 10.0	●			2 3 5
10			End of Boring @ 10.0' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 31

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 11/1/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4" AC over 4" SILTY SAND with GRAVEL (misc. AB)	1.0 - 2.5	■	110.6	17.2	5 6 11
1	SP							
2	CL		+/- 4" POORLY GRADED SAND: brown, loose, moist (Fill)	2.0 - 5.0	○			
3			SANDY LEAN CLAY: dark brown, stiff, very moist					
4								
5	CL		SANDY LEAN CLAY: brown, soft, moist, (Alluvium)	5.0 - 6.5	●			1 2 2
6								
7								
8								
9			medium stiff, caliche deposits	8.5 - 10.0	●			1 2 5
10			End of Boring @ 10.0'					
11			No subsurface water encountered					
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 32

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 11/1/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4" AC over 3.5" SILTY SAND with GRAVEL (misc. AB)					
1	SP			1.0 - 2.5	■	110.8	16.3	4 7 10
2	CL		+/- 4" POORLY GRADED SAND: brown, loose, moist (Fill)	2.0 - 5.0	○			
3			SANDY LEAN CLAY: dark brown, stiff, very moist (Fill)					
4								
5	CL		SANDY LEAN CLAY: brown, soft, moist (Alluvium)	5.0 - 6.5	●			1 1 2
6								
7								
8								
9			medium stiff	8.5 - 10.0	●			1 3 3
10			End of Boring @ 10.0'					
11			No subsurface water encountered					
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 33

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/31/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		5" AC over 5.5" SILTY SAND with GRAVEL (misc. AB)	1.0 - 2.5	■	115.3	15.5	8
1	SP		1.5 - 3.5	○			10
2	SM	+/- 4" POORLY GRADED SAND: brown, loose, moist (Fill)					15
3		SILTY SAND: brown/dark brown mottled, medium dense, very moist, trace to some gravel, trace AC fragments (Fill)	3.5 - 5.0	○			
4	CL						3
5		SANDY LEAN CLAY: brown, medium stiff, moist, caliche deposits (Alluvium)	5.0 - 6.5	●			3
6							3
7		gray/brown mottled					
8							0
9		soft	8.5 - 10.0	●			1
10							3
11		End of Boring @ 10.0'					
12		No subsurface water encountered					
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 34

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/31/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		4" AC over 5" SILTY SAND with GRAVEL (misc. AB)	1.0 - 2.5	■	118.4	13.7	9 11 11
1	SP		1.5 - 3.5	○			
2	CL	+/- 4" POORLY GRADED SAND: brown, loose, moist (Fill)					
3		SANDY LEAN CLAY: dark brown, stiff, moist (Fill)					
4	CL	SANDY LEAN CLAY: brown, medium stiff, moist, caliche deposits (Alluvium)	5.0 - 6.5	●			2 3 3
5							
6							
7							
8			8.5 - 10.0	●			0 1 1
9		gray/brown mottled, very soft					
10		End of Boring @ 10.0' No subsurface water encountered					
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 35

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/30/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			5" AC over 8" SILTY SAND with GRAVEL (misc. AB)					
1	SM		SILTY SAND: orange brown, medium dense, very moist, some gravel (Fill)	1.0 - 2.5	■	117.0	14.6	5, 7, 10
2								
3	CL		SANDY LEAN CLAY: dark brown, stiff, moist	3.0 - 5.0	○			
4	CL		SANDY LEAN CLAY: brown, medium stiff, moist (Alluvium)					
5				5.0 - 6.5	●			2, 3, 3
6			gray/brown mottled, caliche deposits					
7								
8								
9			very soft, very moist	8.5 - 10.0	●			0, 1, 1
10								
11			End of Boring @ 10.0'					
12			No subsurface water encountered					
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 36

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/30/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		5.5" AC over 8" SILTY SAND with GRAVEL (misc. AB)	0.5 - 1.5	○			8
1	SP		1.0 - 2.5	■	114.7	7.2	8
2	CL	+/- 4" POORLY GRADED SAND: brown, loose, moist (Fill)	2.5 - 5.0	○			7
3		SANDY LEAN CLAY: dark brown, stiff, slightly moist					
4							1
5	ML	SILT: gray/brown mottled, medium stiff, moist, caliche deposits (Alluvium)	5.0 - 6.5	●			2
6							4
7							
8		soft	8.5 - 10.0	●			0
9							1
10		End of Boring @ 10.0'					2
11		No subsurface water encountered					
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 37

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/29/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			5.5" AC over 12" SILTY SAND with GRAVEL (misc. AB)	0.5 - 1.5	○			5
1				1.0 - 3.0	■	110.1	16.2	8
2	CL		SANDY LEAN CLAY: dark brown, stiff, very moist (Fill)	1.5 - 3.0	○			12
3	CL		SANDY LEAN CLAY: brown, very soft, moist, caliche deposits (Alluvium)	3.0 - 5.0	○			
4								1
5				5.0 - 6.5	●			1
6								1
7								
8								1
9			gray/brown mottled, soft	8.5 - 10.0	●			1
10								2
11			End of Boring @ 10.0'					
12			No subsurface water encountered					
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 38

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

PAGE 1 OF 1
JOB NO.: 302524-001
DATE: 10/30/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4.5" AC over 12" SILTY SAND with GRAVEL (misc. AB)					
2	CL		SANDY LEAN CLAY: brown/dark brown/yellow brown mottled, stiff, moist (Fill)	1.5 - 3.0	■	110.9	14.7	6, 12, 13
3				2.0 - 4.0	○			
4	CL		SANDY LEAN CLAY: brown, very soft, moist, caliche deposits (Alluvium)	5.0 - 6.5	●			0, 1, 1
8			soft	8.5 - 10.0	●			0, 1, 2
10			End of Boring @ 10.0' No subsurface water encountered					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 39

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/28/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		5" AC over 6" SILTY SAND with GRAVEL (misc. AB)					
1	SM	SILTY SAND: brown, loose, moist (Fill)	1.0 - 2.0	○			3
2	CH	SANDY FAT CLAY: dark brown, medium stiff, very moist (Alluvium)	1.0 - 2.5	■	108.4	19.1	4
3			2.0 - 5.0	○			5
4							
5	CL	SANDY LEAN CLAY: brown, soft, moist, caliche deposits	5.0 - 6.5	●			1 2 2
6							
7							
8		medium stiff	8.5 - 10.0	●			2 3 5
9							
10		End of Boring @ 10.0' No subsurface water encountered					
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 40

LOGGED BY: R. Wagner
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem Auger

JOB NO.: 302524-001
DATE: 10/28/18

OXNARD AIRPORT RWY 7-25 AND TWY CONNECTOR IMPROVEMENTS
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			6" AC over 8" SILTY SAND with GRAVEL (misc. AB)					
1	SM		SILTY SAND: brown, loose, very moist, mixed with sandy lean clay (Fill)	1.5 - 3.5	○			5
2				1.5 - 3.0	■	117.1	16.2	8
3				3.5 - 6.5	○			8
4	CL		SANDY LEAN CLAY: brown, medium stiff, moist, caliche deposits (Alluvium)					1
5			soft	5.0 - 6.5	●			2
6								2
7								
8								0
9				8.5 - 10.0	●			1
10								3
11			End of Boring @ 10.0'					
12			No subsurface water encountered					
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

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APPENDIX B

Laboratory Test Results

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

BULK DENSITY TEST RESULTS

ASTM D 2937-17 (modified for ring liners)

January 8, 2019

BORING NO.	DEPTH feet	MOISTURE CONTENT, %	WET DENSITY, pcf	DRY DENSITY, pcf
1	2.0 - 2.5	13.4	135.4	119.4
2	2.5 - 3.0	13.8	137.8	121.1
3	2.5 - 3.0	14.2	133.6	116.9
4	2.5 - 3.0	16.1	134.9	116.2
5	2.5 - 3.0	14.5	135.4	118.3
6	2.5 - 3.0	13.3	137.7	121.5
7	2.0 - 2.5	13.3	138.2	121.9
8	2.0 - 2.5	4.7	123.7	118.1
9	2.5 - 3.0	19.7	122.8	102.6
10	2.5 - 3.0	13.6	130.6	115.0
11	2.5 - 3.0	21.5	126.3	104.0
12	2.5 - 3.0	24.8	119.2	95.5
13	2.5 - 3.0	22.0	123.5	101.2
14	2.5 - 3.0	22.0	125.1	102.5
15	2.5 - 3.0	23.4	123.5	100.1
16	2.5 - 3.0	19.0	130.0	109.3
17	2.5 - 3.0	20.8	126.7	104.8
18	2.5 - 3.0	20.1	124.0	103.2
19	2.5 - 3.0	16.9	132.5	113.4
20	2.5 - 3.0	17.6	131.3	111.7
21	2.5 - 3.0	13.9	136.1	119.5
22	3.0 - 3.5	17.6	134.1	114.0
23	2.5 - 3.0	13.8	134.8	118.5
24	2.5 - 3.0	5.6	113.1	107.2
25	2.5 - 3.0	19.0	126.5	106.3
26	3.0 - 3.5	17.1	128.9	110.1
27	3.0 - 3.5	20.8	117.6	97.4
28	2.5 - 3.0	4.9	128.6	122.5
29	2.5 - 3.0	15.3	129.7	112.5
30	2.5 - 3.0	14.7	128.7	112.2
31	2.5 - 3.0	17.2	129.6	110.6
32	2.0 - 2.5	16.3	128.8	110.8
33	2.0 - 2.5	15.5	133.1	115.3
34	2.0 - 2.5	13.7	134.6	118.4

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

BULK DENSITY TEST RESULTS

ASTM D 2937-17 (modified for ring liners)

January 8, 2019

BORING NO.	DEPTH feet	MOISTURE CONTENT, %	WET DENSITY, pcf	DRY DENSITY, pcf
35	2.0 - 2.5	14.6	134.1	117.0
36	2.0 - 2.5	7.2	123.0	114.7
37	2.5 - 3.0	16.2	127.9	110.1
38	2.5 - 3.0	14.7	127.2	110.9
39	2.0 - 2.5	19.1	129.1	108.4
40	2.5 - 3.0	16.2	136.0	117.1

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

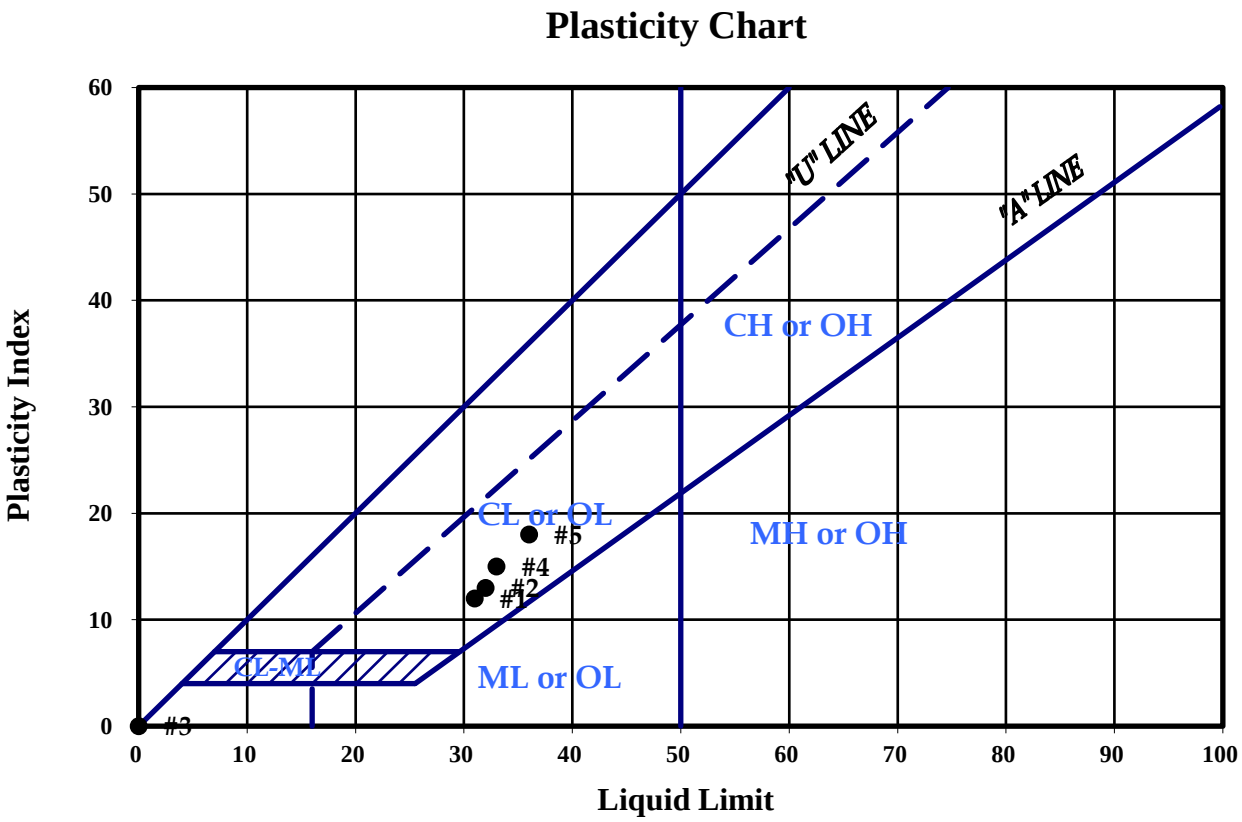
302524-001

PLASTICITY INDEX

ASTM D 4318-17

January 8, 2019

Designation.:	CBR 1	CBR 2	CBR 4	CBR 5	CBR 7
Test No.:	**1**	**2**	**3**	**4**	**5**
Boring No.:	1	9	3	36	23
Sample Depth:	2.0 - 3.0'	3.0 - 5.0'	0.5 - 1.0'	2.0 - 5.0'	3.5 - 5.0'
Liquid Limit:	31	32	NL	33	36
Plastic Limit:	19	19	NP	18	18
Plasticity Index:	12	13	NP	15	18



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

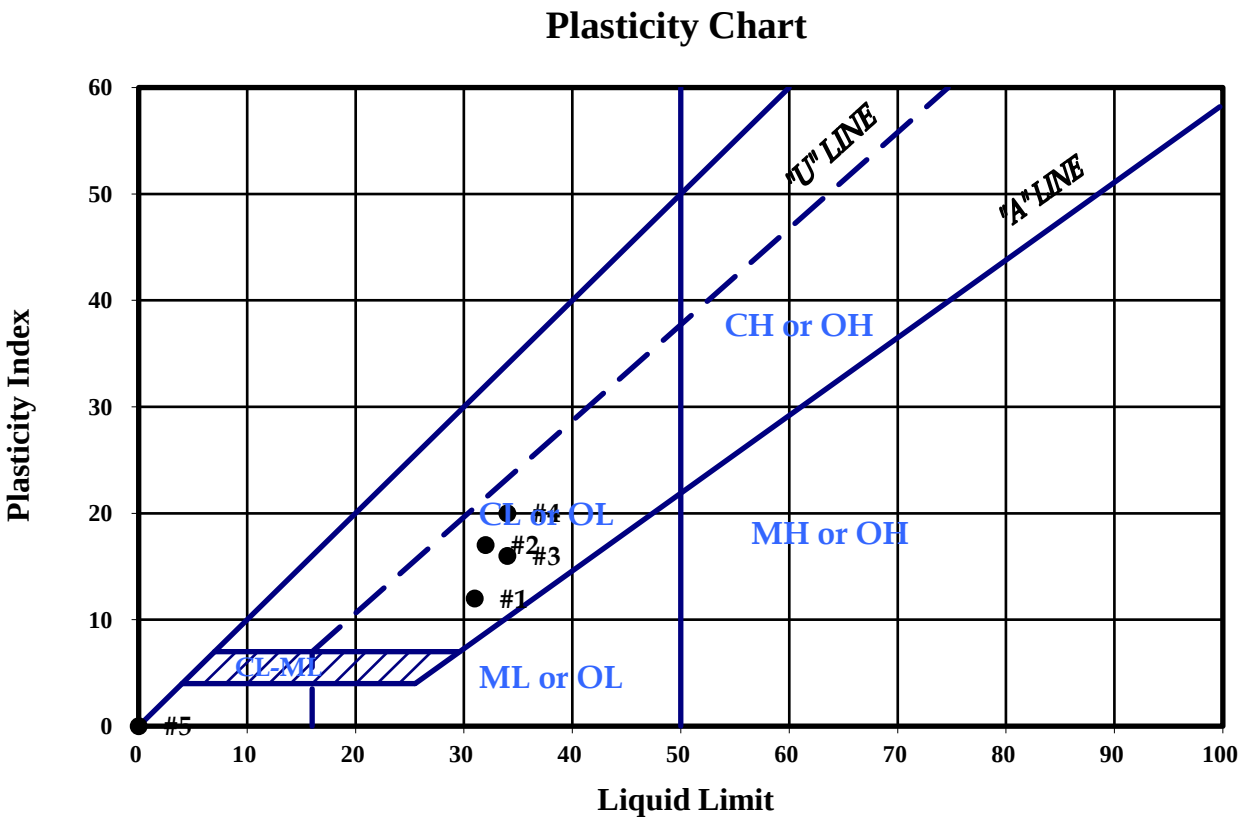
302524-001

PLASTICITY INDEX

ASTM D 4318-17

January 8, 2019

Designation.:	CBR 8	CBR 9	CBR 11	CBR 12	CBR 13
Test No.:	**1**	**2**	**3**	**4**	**5**
Boring No.:	29	21	16	13	40
Sample Depth:	2.0 - 5.0'	1.5 - 3.0'	2.0 - 4.0'	2.0 - 5.0'	1.5 - 3.5'
Liquid Limit:	31	32	34	34	NL
Plastic Limit:	19	15	18	14	NP
Plasticity Index:	12	17	16	20	NP



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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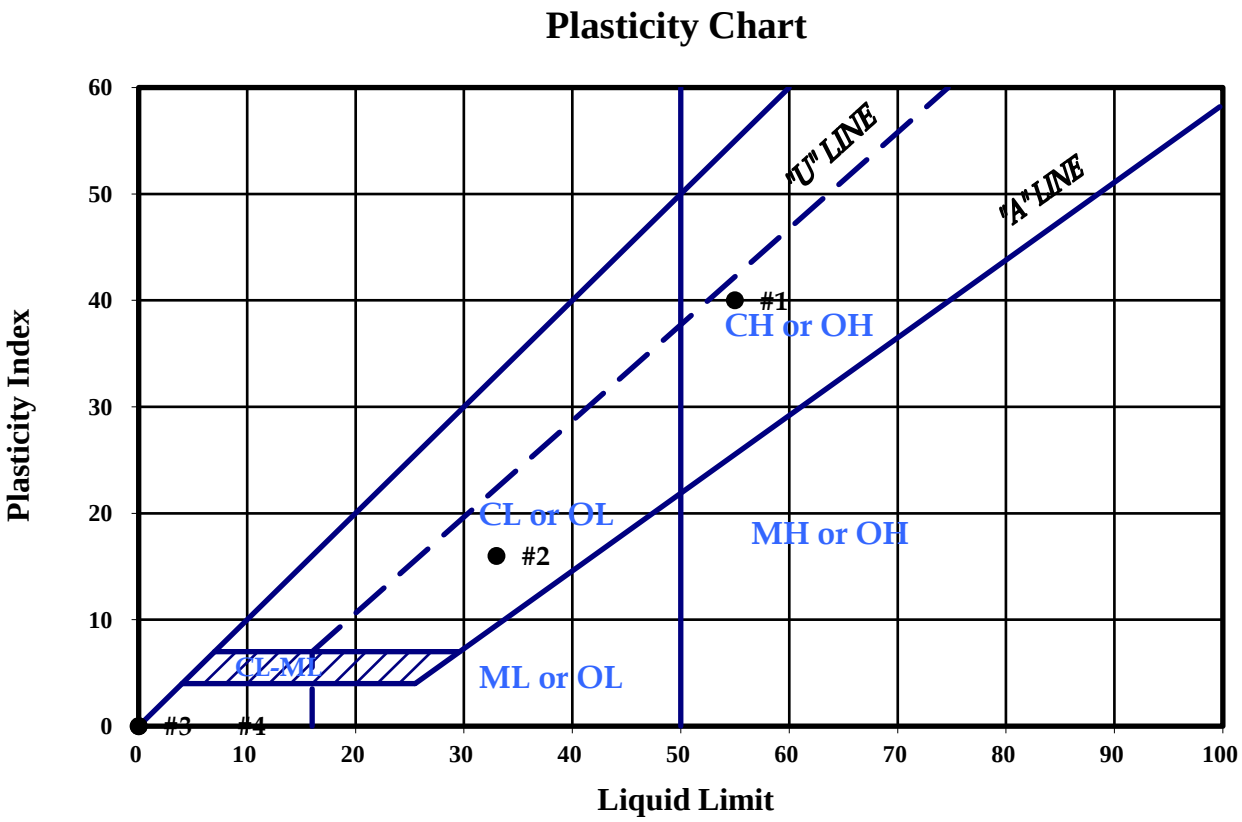
PLASTICITY INDEX

ASTM D 4318-17

January 8, 2019

Designation.:	CBR 14	CBR 15	CBR 16	CBR 17	
Test No.:	**1**	**2**	**3**	**4**	
Boring No.:	39	17	28	14	
Sample Depth:	2.0 - 5.0'	0.5 - 1.5'	0.5 - 1.5'	0.5 - 1.5'	
Liquid Limit:	55	33	NL	NL	
Plastic Limit:	15	17	NP	NP	
Plasticity Index:	40	16	NP	NP	



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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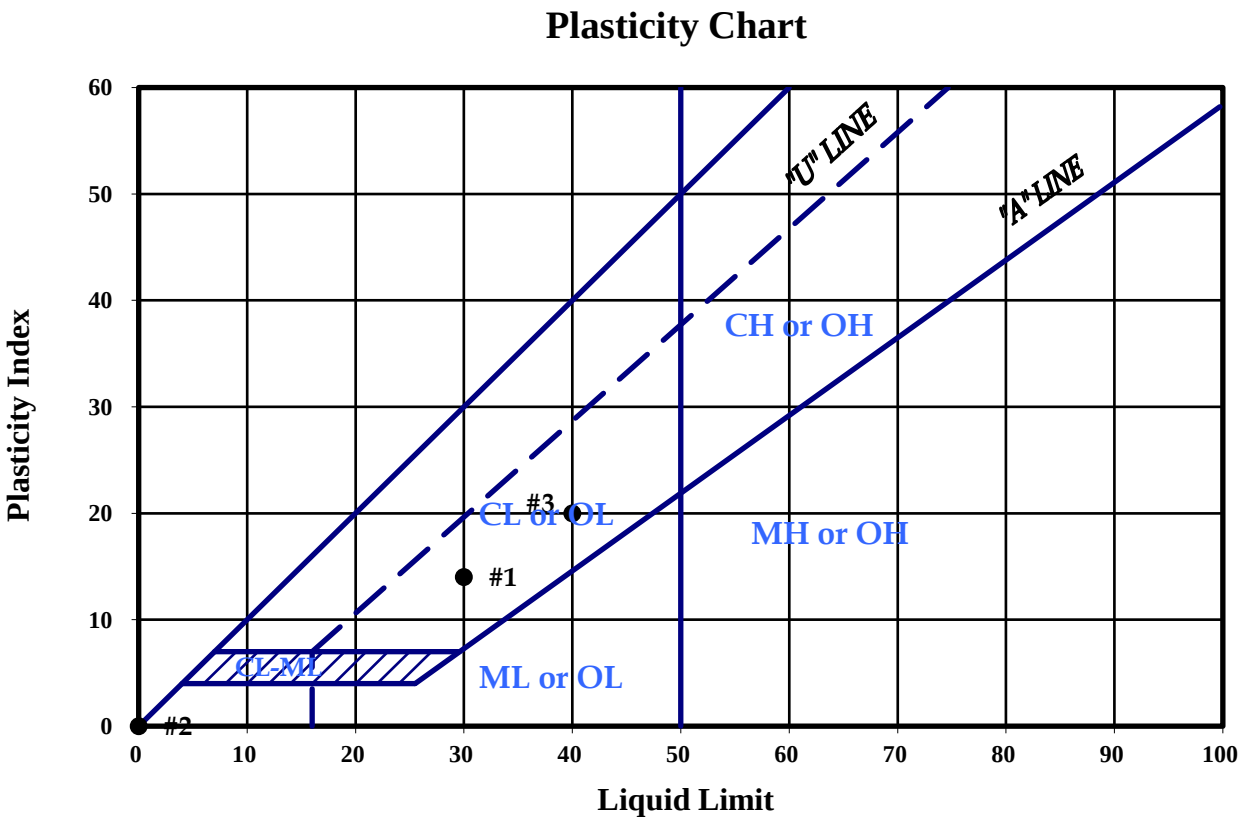
PLASTICITY INDEX

ASTM D 4318-17

January 8, 2019

Designation.:		CBR 3	CBR 6		
Test No.:	**1**	**2**	**3**		
Boring No.:	9	5	27		
Sample Depth:	0.5 - 1.5'	2.0 - 4.0'	0.5 - 1.5'		
Liquid Limit:	30	NL	40		
Plastic Limit:	16	NP	20		
Plasticity Index:	14	NP	20		



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #1; Boring #1 @ 2.0 - 5.0'

January 8, 2019

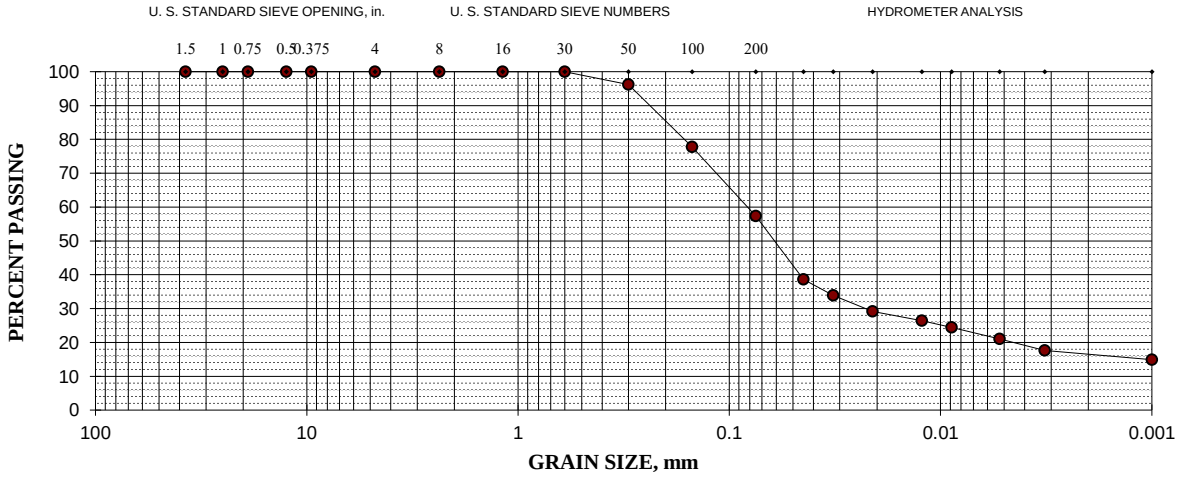
Sandy Lean Clay (CL)

Specific Gravity = 2.70 (assumed)

LL = 31; PL = 19; PI = 12

Gravel = 0%; Sand = 43%; Silt = 36%; Clay = 21%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	0	100
#8 (2.36-mm)	0	100
#16 (1.18-mm)	0	100
#30 (600-µm)	0	100
#50 (300-µm)	4	96
#100 (150-µm)	22	78
#200 (75-µm)	43	57
Hydrometer Analysis		
45-µm		39
32-µm		34
21-µm		29
12-µm		26
9-µm		24
5.2-µm		21
3.2-µm		18
Colloids		15



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #2; Boring #9 @ 3.0 - 5.0'

January 8, 2019

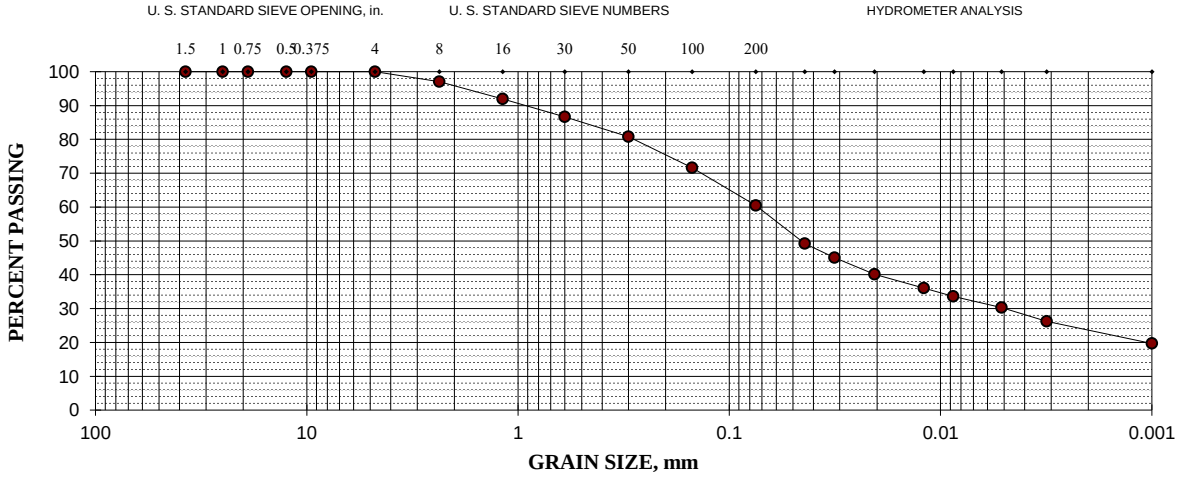
Sandy Lean Clay (CL)

Specific Gravity = 2.70 (assumed)

LL = 32; PL = 19; PI = 13

Gravel = 0%; Sand = 40%; Silt = 30%; Clay = 30%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	0	100
#8 (2.36-mm)	3	97
#16 (1.18-mm)	8	92
#30 (600-µm)	13	87
#50 (300-µm)	19	81
#100 (150-µm)	28	72
#200 (75-µm)	40	60
Hydrometer Analysis		
44-µm		49
32-µm		45
21-µm		40
12-µm		36
9-µm		34
5.1-µm		30
3.1-µm		26
Colloids		20



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

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PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #3; Boring #5 @ 2.0 - 4.0'

January 16, 2019

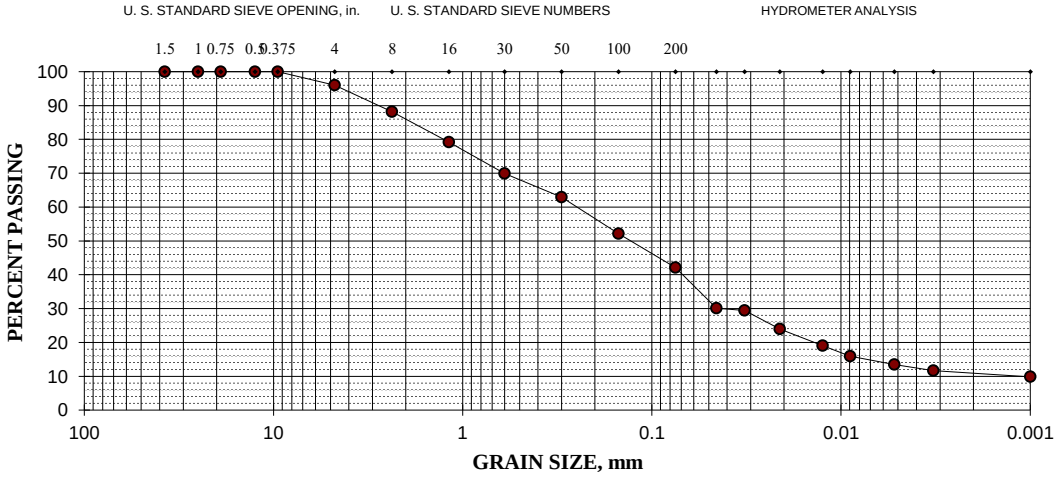
Silty Sand (SM)

Specific Gravity = 2.65 (assumed)

PI = NP

Gravel = 4%; Sand = 54%; Silt = 28%; Clay = 14%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	4	96
#8 (2.36-mm)	12	88
#16 (1.18-mm)	21	79
#30 (600-µm)	30	70
#50 (300-µm)	37	63
#100 (150-µm)	48	52
#200 (75-µm)	58	42
Hydrometer Analysis		
46-µm		30
32-µm		29
21-µm		24
13-µm		19
9-µm		16
5.2-µm		14
3.2-µm		12
Colloids		10



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #4; Boring #3 @ 0.5 - 1.0'

January 8, 2019

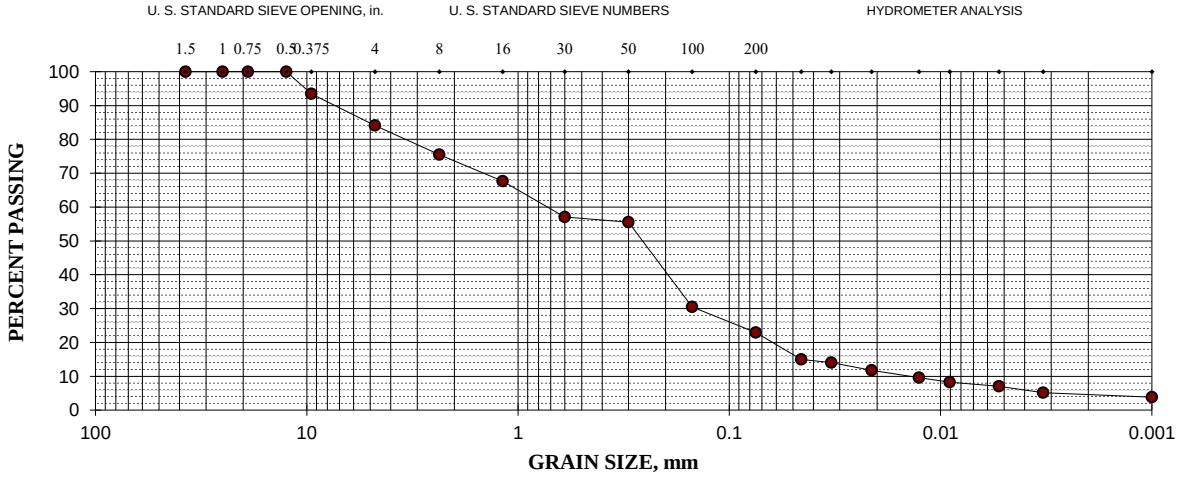
Clayey Sand with Gravel (SC)

Specific Gravity = 2.65 (assumed)

PI = NP

Gravel = 16%; Sand = 61%; Silt = 16%; Clay = 7%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	7	93
#4 (4.75-mm)	16	84
#8 (2.36-mm)	24	76
#16 (1.18-mm)	32	68
#30 (600-µm)	43	57
#50 (300-µm)	44	56
#100 (150-µm)	70	30
#200 (75-µm)	77	23
Hydrometer Analysis		
46-µm		15
33-µm		14
21-µm		12
13-µm		10
9-µm		8
5.3-µm		7
3.3-µm		5
Colloids		4



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #5; Boring #36 @ 2.5 - 5.0'

January 8, 2019

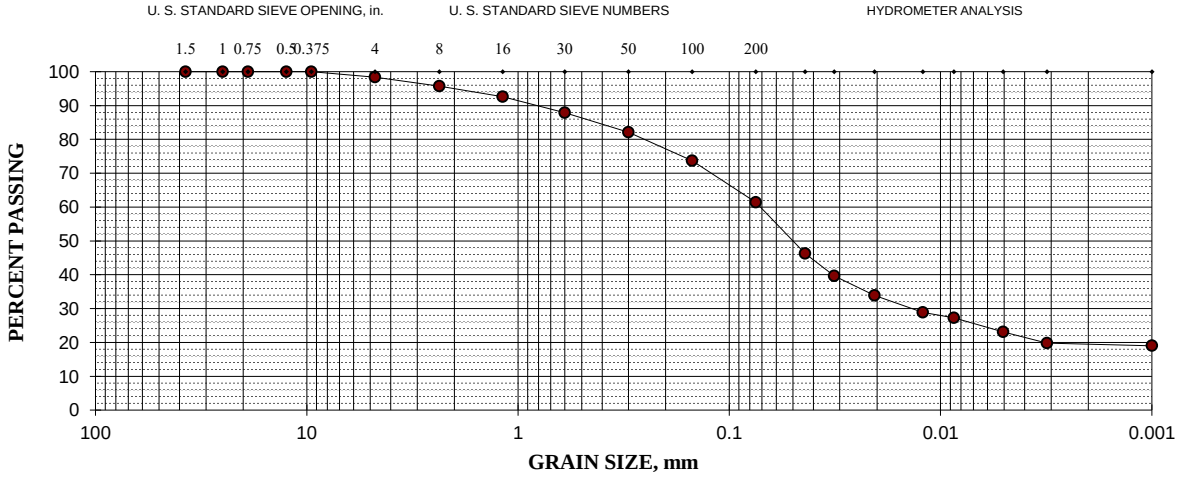
Sandy Lean Clay (CL)

Specific Gravity = 2.70 (assumed)

LL = 33; PL = 18; PI = 15

Gravel = 2%; Sand = 37%; Silt = 38%; Clay = 23%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	2	98
#8 (2.36-mm)	4	96
#16 (1.18-mm)	7	93
#30 (600-µm)	12	88
#50 (300-µm)	18	82
#100 (150-µm)	26	74
#200 (75-µm)	39	61
Hydrometer Analysis		
44-µm		46
32-µm		40
21-µm		34
12-µm		29
9-µm		27
5.0-µm		23
3.1-µm		20
Colloids		19



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

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PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #6 with 3% Lime added; Boring #27 @ 2.0 - 4.0'

January 8, 2019

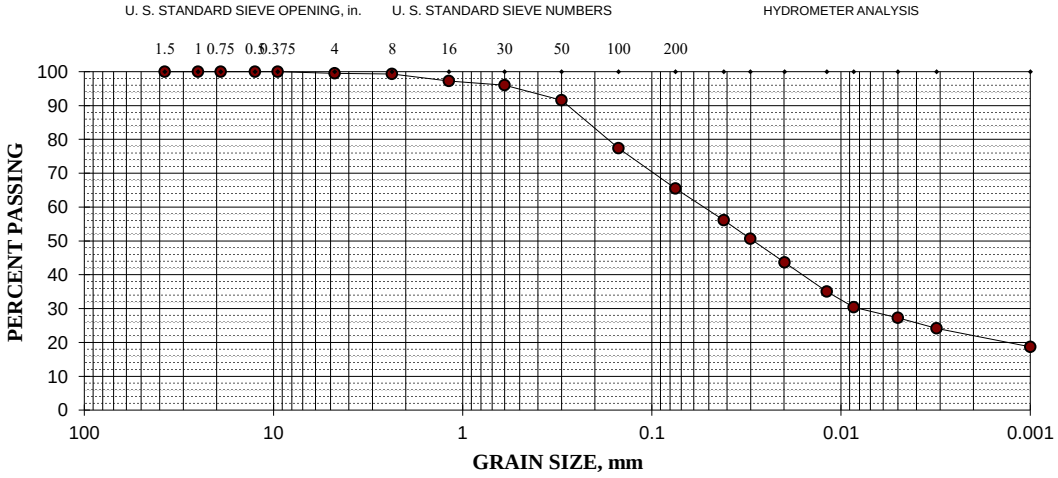
Sandy Lean Clay (CL)

Specific Gravity = 2.70 (assumed)

LL = 40; PL = 20; PI = 20

Gravel = 1%; Sand = 34%; Silt = 38%; Clay = 27%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	1	99
#8 (2.36-mm)	1	99
#16 (1.18-mm)	3	97
#30 (600-µm)	4	96
#50 (300-µm)	8	92
#100 (150-µm)	23	77
#200 (75-µm)	35	65
Hydrometer Analysis		
42-µm		56
30-µm		51
20-µm		44
12-µm		35
9-µm		30
5.0-µm		27
3.1-µm		24
Colloids		19



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #7; Boring #23 @ 3.5 - 5.0'

January 8, 2019

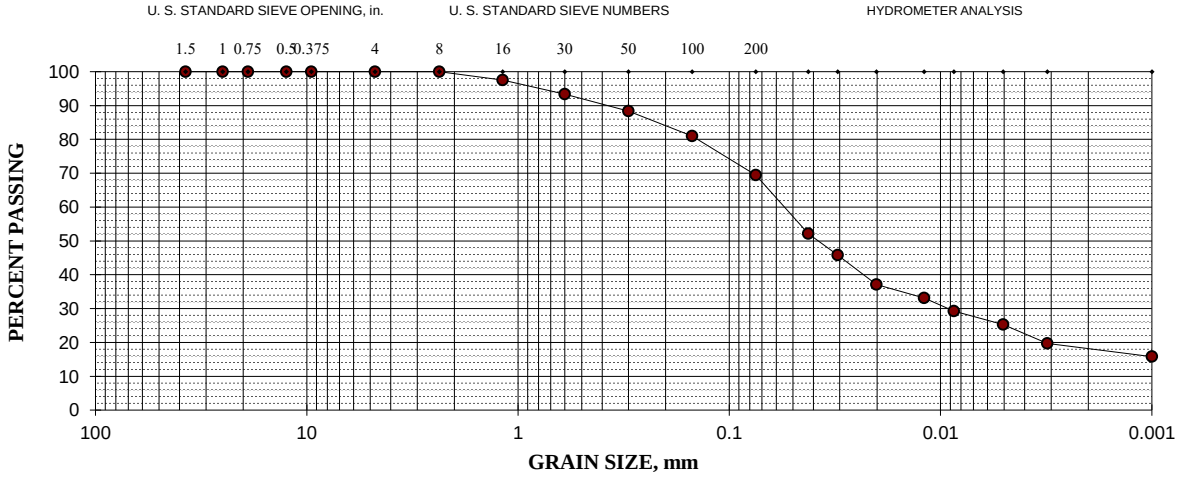
Sandy Lean Clay (CL)

Specific Gravity = 2.70 (assumed)

LL = 36; PL = 18; PI = 18

Gravel = 0%; Sand = 31%; Silt = 44%; Clay = 25%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	0	100
#8 (2.36-mm)	0	100
#16 (1.18-mm)	2	98
#30 (600-µm)	7	93
#50 (300-µm)	12	88
#100 (150-µm)	19	81
#200 (75-µm)	31	69
Hydrometer Analysis		
42-µm		52
31-µm		46
20-µm		37
12-µm		33
9-µm		29
5.0-µm		25
3.1-µm		20
Colloids		16



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #8; Boring #29 @ 2.0 - 5.0'

January 8, 2019

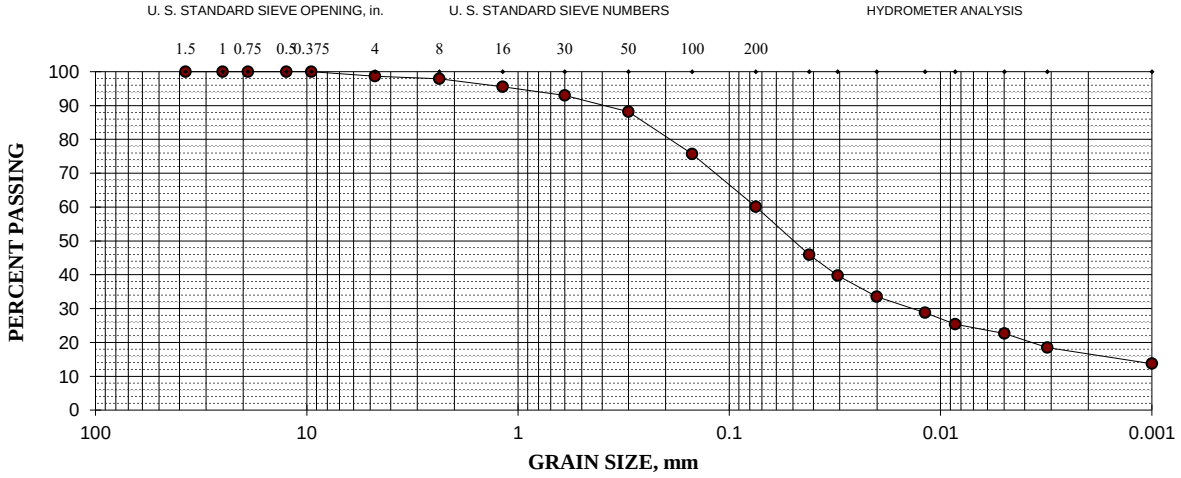
Sandy Lean Clay (CL)

Specific Gravity = 2.70 (assumed)

LL = 31; PL = 19; PI = 12

Gravel = 1%; Sand = 39%; Silt = 37%; Clay = 23%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	1	99
#8 (2.36-mm)	2	98
#16 (1.18-mm)	4	96
#30 (600-µm)	7	93
#50 (300-µm)	12	88
#100 (150-µm)	24	76
#200 (75-µm)	40	60
Hydrometer Analysis		
42-µm		46
31-µm		40
20-µm		34
12-µm		29
9-µm		25
5.0-µm		23
3.1-µm		18
Colloids		14



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #9; Boring #21 @ 1.5 - 3.0'

January 8, 2019

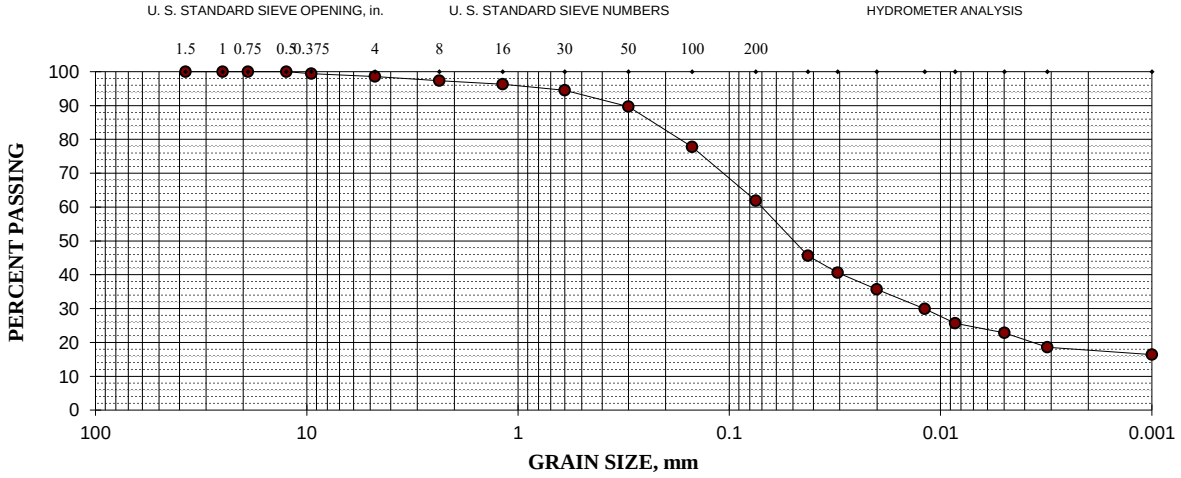
Sandy Lean Clay (CL)

Specific Gravity = 2.70 (assumed)

LL = 32; PL = 15; PI = 17

Gravel = 1%; Sand = 37%; Silt = 39%; Clay = 23%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	1	99
#4 (4.75-mm)	1	99
#8 (2.36-mm)	3	97
#16 (1.18-mm)	4	96
#30 (600-µm)	6	94
#50 (300-µm)	10	90
#100 (150-µm)	22	78
#200 (75-µm)	38	62
Hydrometer Analysis		
42-µm		46
31-µm		41
20-µm		36
12-µm		30
9-µm		26
5.0-µm		23
3.1-µm		19
Colloids		16



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #11; Boring #16 @ 2.0 - 4.0'

January 8, 2019

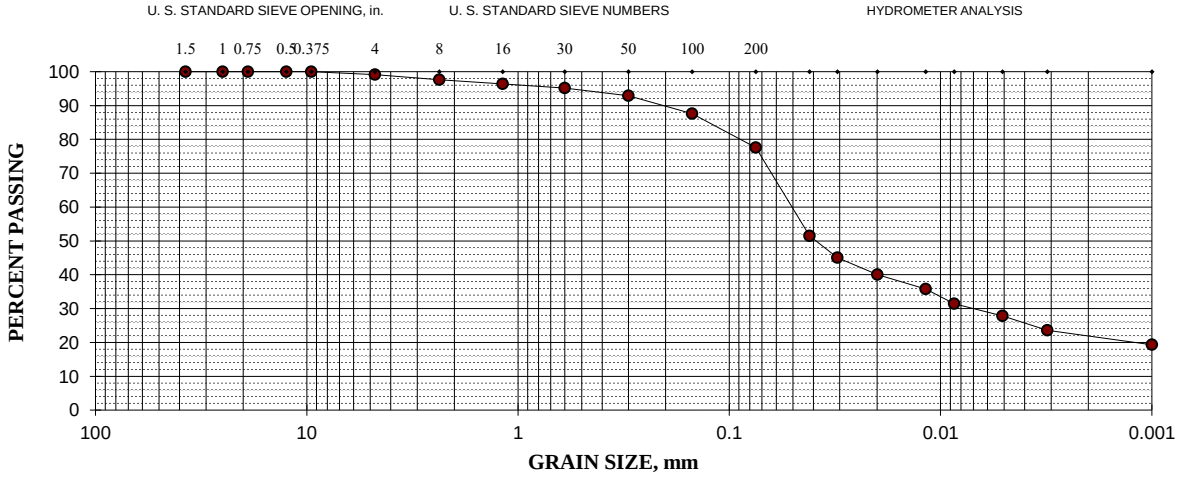
Sandy Lean Clay (CL)

Specific Gravity = 2.70 (assumed)

LL = 34; PL = 18; PI = 16

Gravel = 1%; Sand = 21%; Silt = 50%; Clay = 28%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	1	99
#8 (2.36-mm)	2	98
#16 (1.18-mm)	4	96
#30 (600-µm)	5	95
#50 (300-µm)	7	93
#100 (150-µm)	12	88
#200 (75-µm)	22	78
Hydrometer Analysis		
42-µm		51
31-µm		45
20-µm		40
12-µm		36
9-µm		31
5.1-µm		28
3.1-µm		24
Colloids		19



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #12; Boring #13 @ 2.0 - 4.0'

January 8, 2019

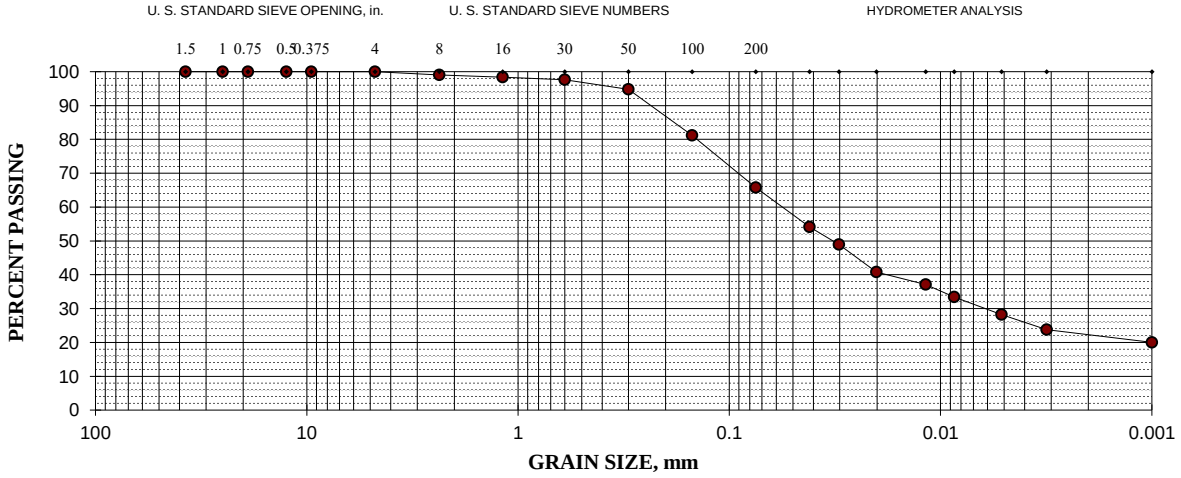
Sandy Lean Clay (CL)

Specific Gravity = 2.70 (assumed)

LL = 34; PL = 14; PI = 20

Gravel = 0%; Sand = 34%; Silt = 38%; Clay = 28%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	0	100
#8 (2.36-mm)	1	99
#16 (1.18-mm)	2	98
#30 (600-µm)	2	98
#50 (300-µm)	5	95
#100 (150-µm)	19	81
#200 (75-µm)	34	66
Hydrometer Analysis		
42-µm		54
30-µm		49
20-µm		41
12-µm		37
9-µm		33
5.1-µm		28
3.1-µm		24
Colloids		20



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #13; Boring #40 @ 1.5 - 3.5'

January 8, 2019

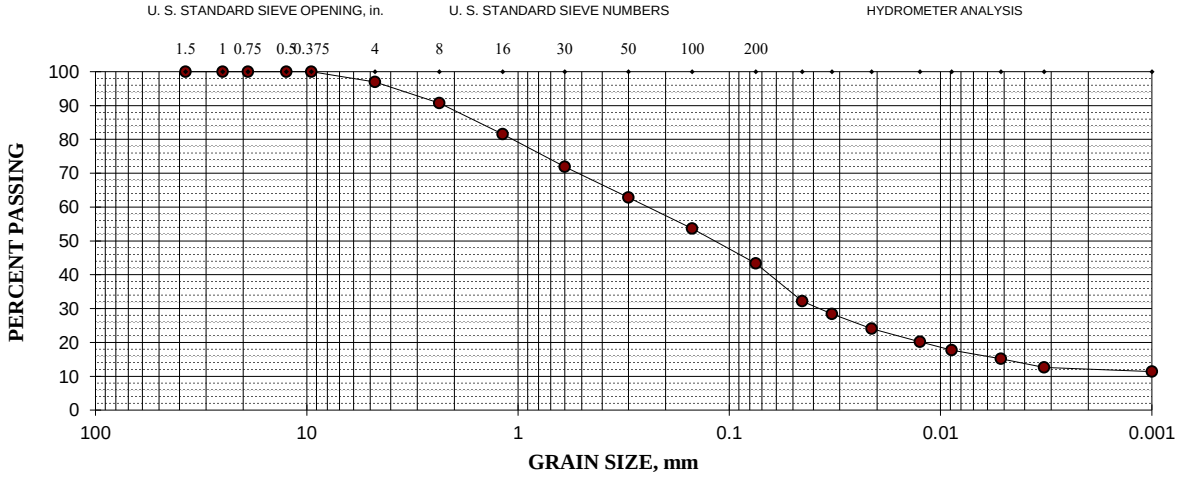
Silty Sand (SM)

Specific Gravity = 2.65 (assumed)

PI = NP

Gravel = 3%; Sand = 54%; Silt = 28%; Clay = 15%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	3	97
#8 (2.36-mm)	9	91
#16 (1.18-mm)	19	81
#30 (600-µm)	28	72
#50 (300-µm)	37	63
#100 (150-µm)	46	54
#200 (75-µm)	57	43
Hydrometer Analysis		
45-µm		32
33-µm		28
21-µm		24
13-µm		20
9-µm		18
5.2-µm		15
3.2-µm		13
Colloids		11



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #14; Boring #39 @ 2.0 - 5.0'

January 8, 2019

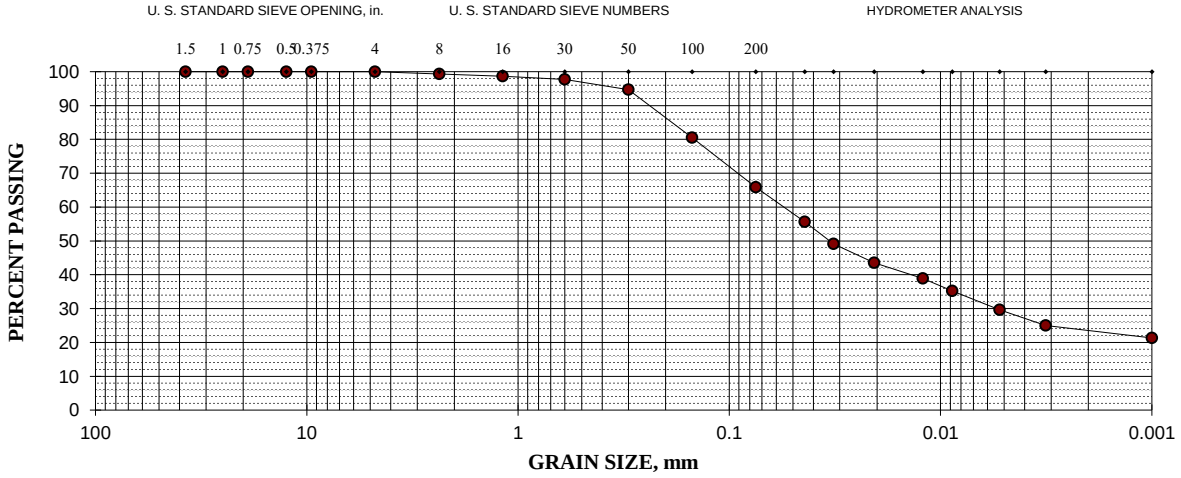
Sandy Fat Clay (CH)

Specific Gravity = 2.70 (assumed)

LL = 55; PL = 15; PI = 40

Gravel = 0%; Sand = 34%; Silt = 36%; Clay = 30%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	0	100
#8 (2.36-mm)	1	99
#16 (1.18-mm)	1	99
#30 (600-µm)	2	98
#50 (300-µm)	5	95
#100 (150-µm)	20	80
#200 (75-µm)	34	66
Hydrometer Analysis		
44-µm		56
32-µm		49
21-µm		44
12-µm		39
9-µm		35
5.2-µm		30
3.2-µm		25
Colloids		21



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #15; Boring #17 @ 0.5 - 1.5'

January 8, 2019

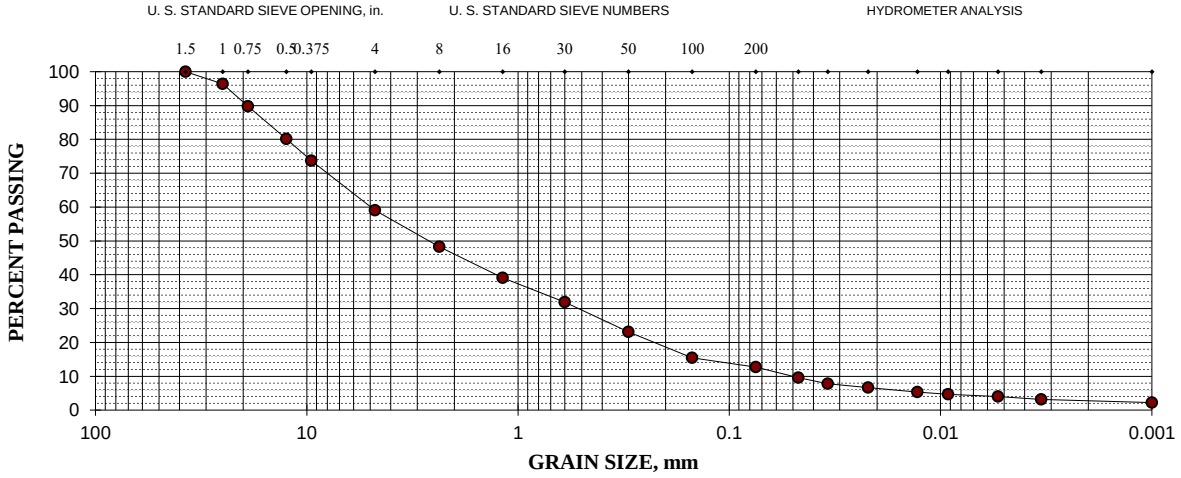
Clayey Sand with Gravel (SC)

Specific Gravity = 2.65 (assumed)

LL = 33; PL = 17; PI = 16

Gravel = 41%; Sand = 46%; Silt = 9%; Clay = 4%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	4	96
3/4" (19.0-mm)	10	90
1/2" (12.5-mm)	20	80
3/8" (9.5-mm)	26	74
#4 (4.75-mm)	41	59
#8 (2.36-mm)	52	48
#16 (1.18-mm)	61	39
#30 (600-µm)	68	32
#50 (300-µm)	77	23
#100 (150-µm)	85	15
#200 (75-µm)	87	13
Hydrometer Analysis		
47-µm		10
34-µm		8
22-µm		7
13-µm		5
9-µm		5
5.3-µm		4
3.3-µm		3
Colloids		2



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #16; Boring #28 @ 0.5 - 1.5'

January 8, 2019

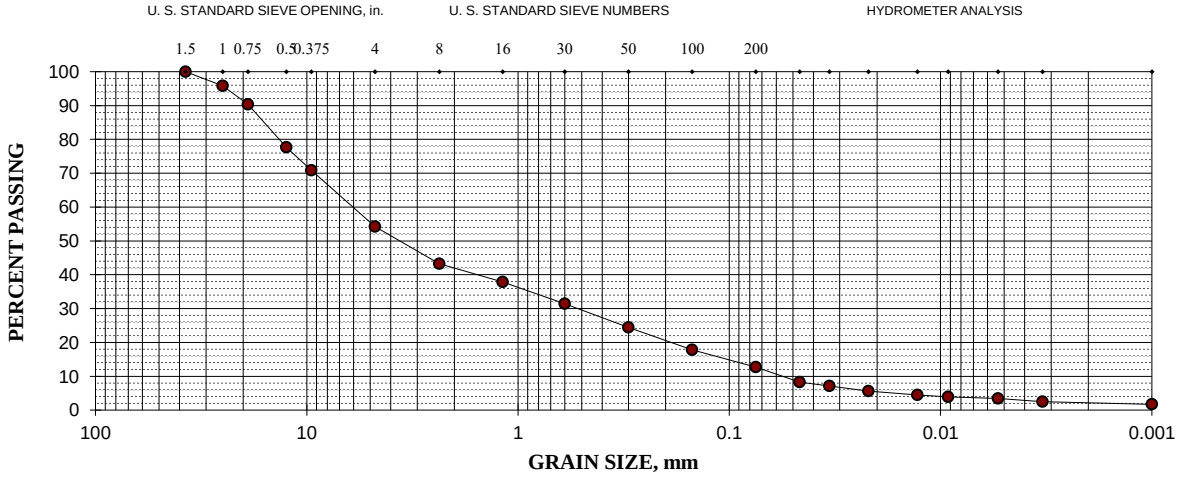
Silty Gravel with Sand (GM)

Specific Gravity = 2.65 (assumed)

PI = NP

Gravel = 46%; Sand = 41%; Silt = 10%; Clay = 3%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	4	96
3/4" (19.0-mm)	10	90
1/2" (12.5-mm)	22	78
3/8" (9.5-mm)	29	71
#4 (4.75-mm)	46	54
#8 (2.36-mm)	57	43
#16 (1.18-mm)	62	38
#30 (600-µm)	69	31
#50 (300-µm)	76	24
#100 (150-µm)	82	18
#200 (75-µm)	87	13
Hydrometer Analysis		
47-µm		8
34-µm		7
22-µm		6
13-µm		5
9-µm		4
5.3-µm		3
3.3-µm		2
Colloids		2



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

CBR #17; Boring #14 @ 0.5 - 1.5'

January 8, 2019

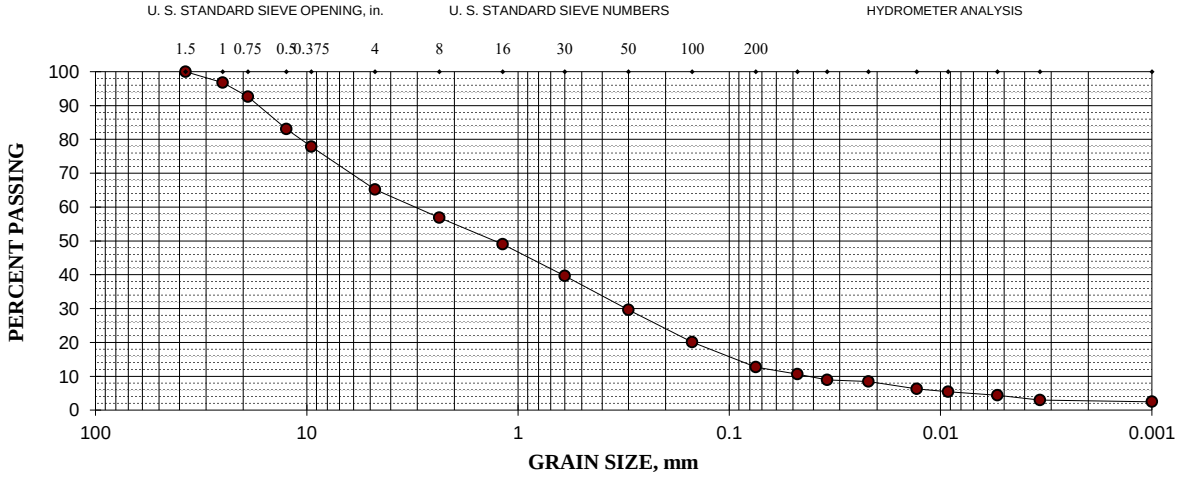
Silty Sand with Gravel (SM)

Specific Gravity = 2.65 (assumed)

PI = NP

Gravel = 35%; Sand = 52%; Silt = 9%; Clay = 4%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	3	97
3/4" (19.0-mm)	7	93
1/2" (12.5-mm)	17	83
3/8" (9.5-mm)	22	78
#4 (4.75-mm)	35	65
#8 (2.36-mm)	43	57
#16 (1.18-mm)	51	49
#30 (600-µm)	60	40
#50 (300-µm)	70	30
#100 (150-µm)	80	20
#200 (75-µm)	87	13
Hydrometer Analysis		
48-µm		11
34-µm		9
22-µm		8
13-µm		6
9-µm		5
5.4-µm		4
3.4-µm		3
Colloids		2



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

Boring #7 @ 2.0 - 3.5'

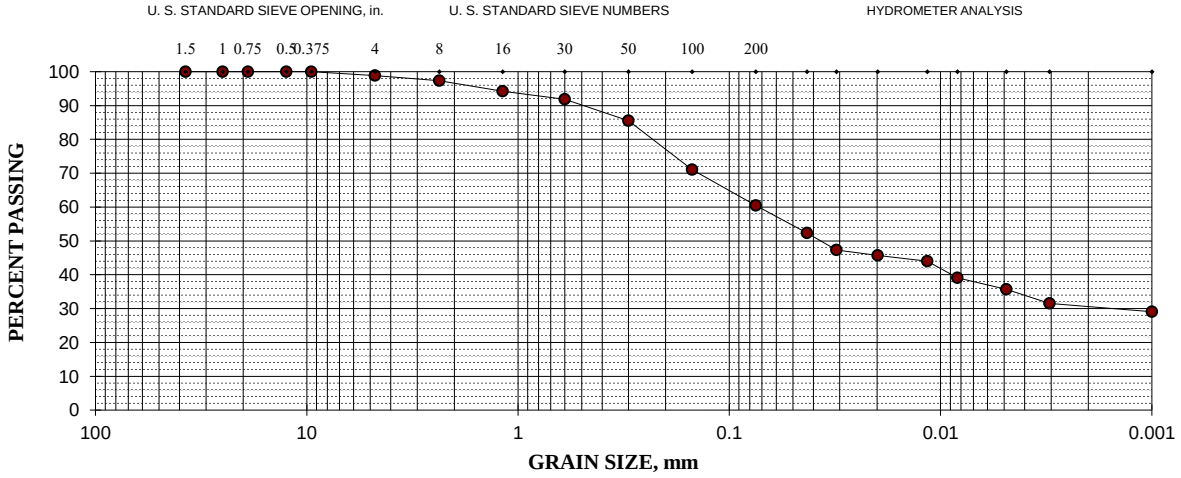
January 8, 2019

Sandy Lean Clay (CL)

Specific Gravity = 2.70 (assumed)

Gravel = 1%; Sand = 39%; Silt = 24%; Clay = 36%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	1	99
#8 (2.36-mm)	3	97
#16 (1.18-mm)	6	94
#30 (600-µm)	8	92
#50 (300-µm)	14	86
#100 (150-µm)	29	71
#200 (75-µm)	40	60
Hydrometer Analysis		
43-µm		52
31-µm		47
20-µm		46
12-µm		44
8-µm		39
4.9-µm		36
3.0-µm		32
Colloids		29



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

Boring #9 @ 1.5 - 3.0'

January 8, 2019

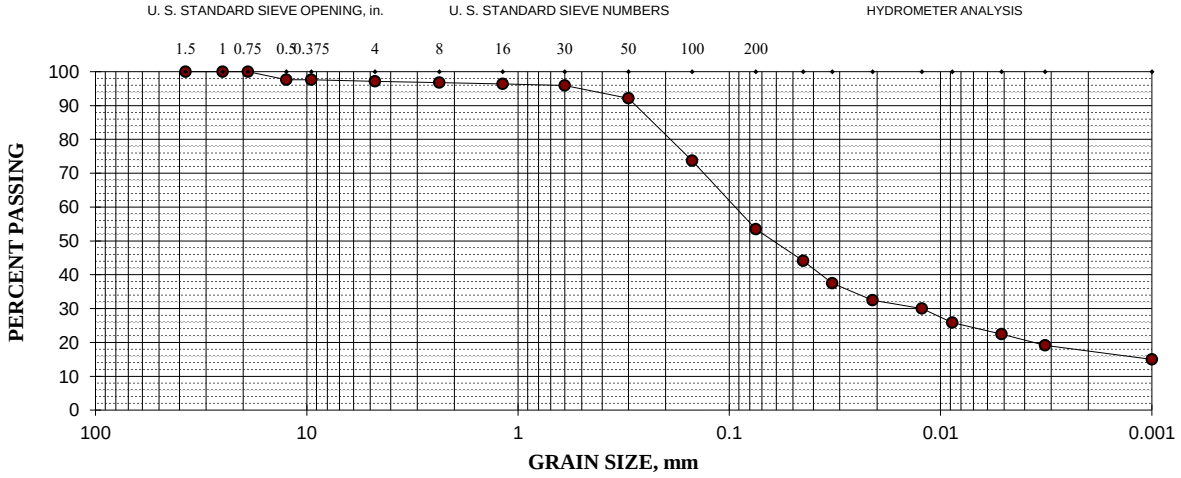
Sandy Lean Clay (CL)

Specific Gravity = 2.70 (assumed)

LL = 30; PL = 16; PI = 14

Gravel = 3%; Sand = 44%; Silt = 31%; Clay = 22%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	2	98
3/8" (9.5-mm)	2	98
#4 (4.75-mm)	3	97
#8 (2.36-mm)	3	97
#16 (1.18-mm)	4	96
#30 (600-µm)	4	96
#50 (300-µm)	8	92
#100 (150-µm)	26	74
#200 (75-µm)	47	53
Hydrometer Analysis		
45-µm		44
33-µm		37
21-µm		32
12-µm		30
9-µm		26
5.1-µm		22
3.2-µm		19
Colloids		15



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

Boring #10 @ 1.5 - 2.5'

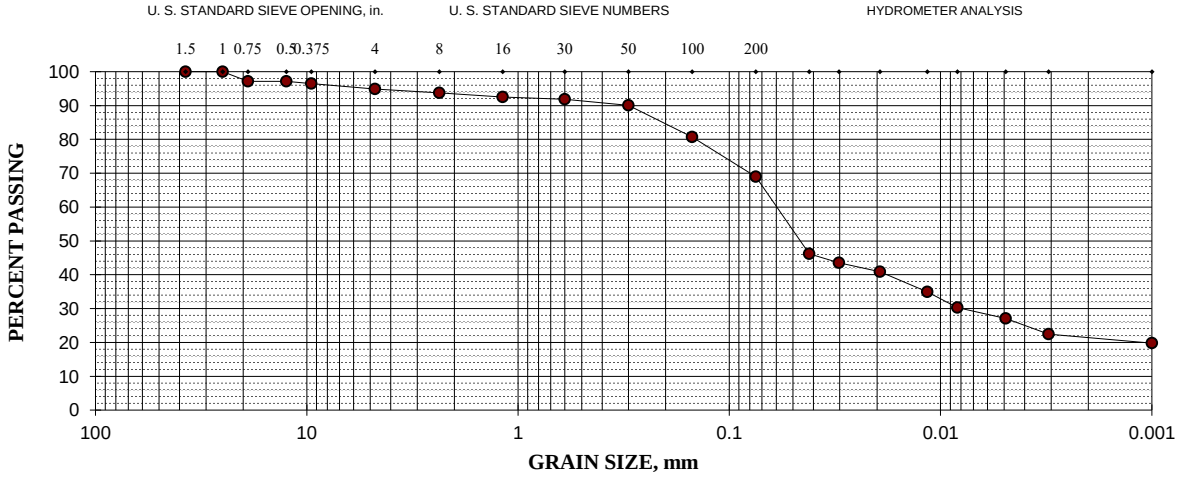
January 8, 2019

Sandy Lean Clay (CL)

Specific Gravity = 2.70 (assumed)

Gravel = 5%; Sand = 26%; Silt = 42%; Clay = 27%

Sieve size	% Retained	% Passing
1-1/2" (37.5-mm)	0	100
1" (25.0-mm)	0	100
3/4" (19.0-mm)	3	97
1/2" (12.5-mm)	3	97
3/8" (9.5-mm)	4	96
#4 (4.75-mm)	5	95
#8 (2.36-mm)	6	94
#16 (1.18-mm)	8	92
#30 (600-µm)	8	92
#50 (300-µm)	10	90
#100 (150-µm)	19	81
#200 (75-µm)	31	69
Hydrometer Analysis		
42-µm		46
30-µm		44
19-µm		41
12-µm		35
8-µm		30
4.9-µm		27
3.1-µm		22
Colloids		20



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.70 (assumed)

January 8, 2019

CBR #1; Boring #1 @ 2.0 - 5.0'

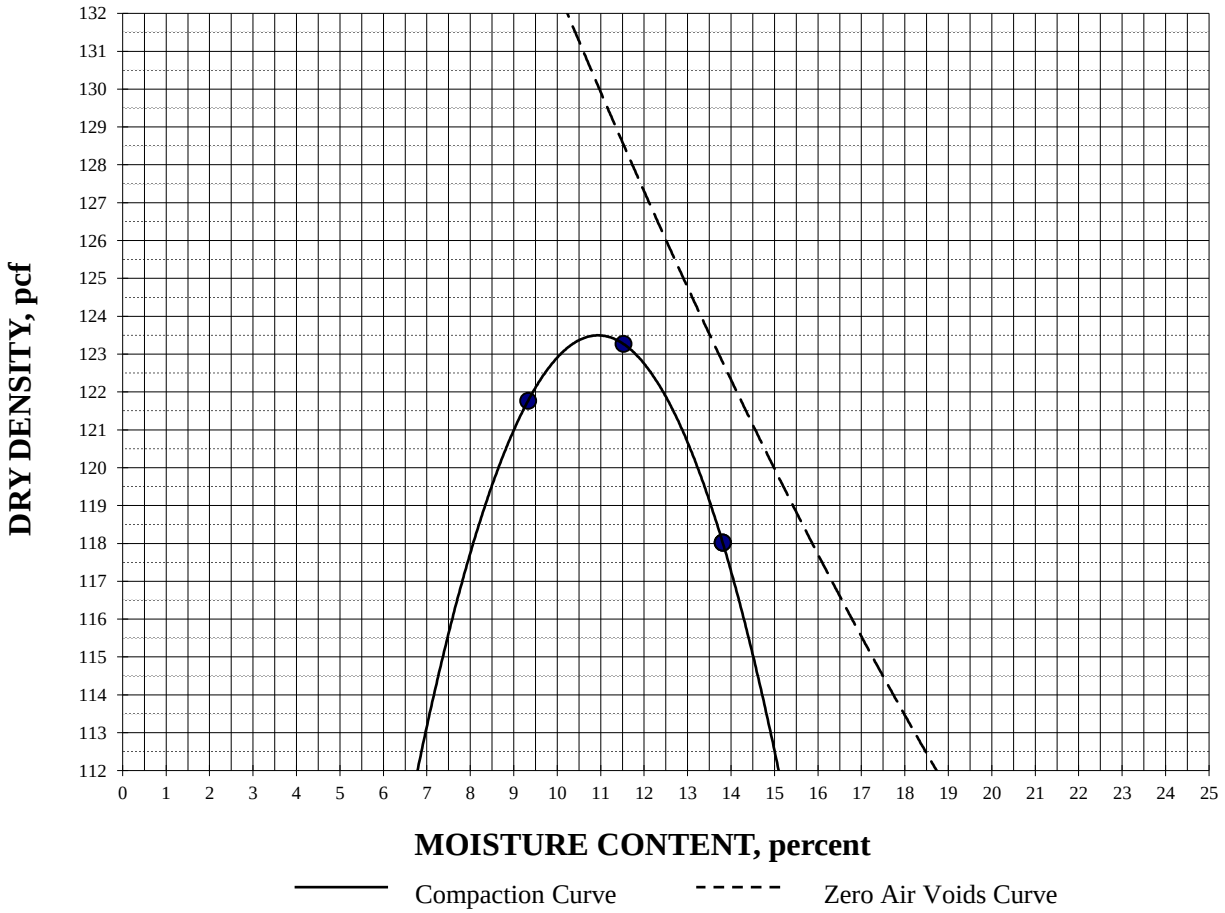
Dark Brown Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	0
#4	0

MAXIMUM DRY DENSITY: 123.5 pcf

OPTIMUM MOISTURE: 10.9%



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.70 (assumed)

January 8, 2019

CBR #2; Boring #9 @ 3.0 - 5.0'

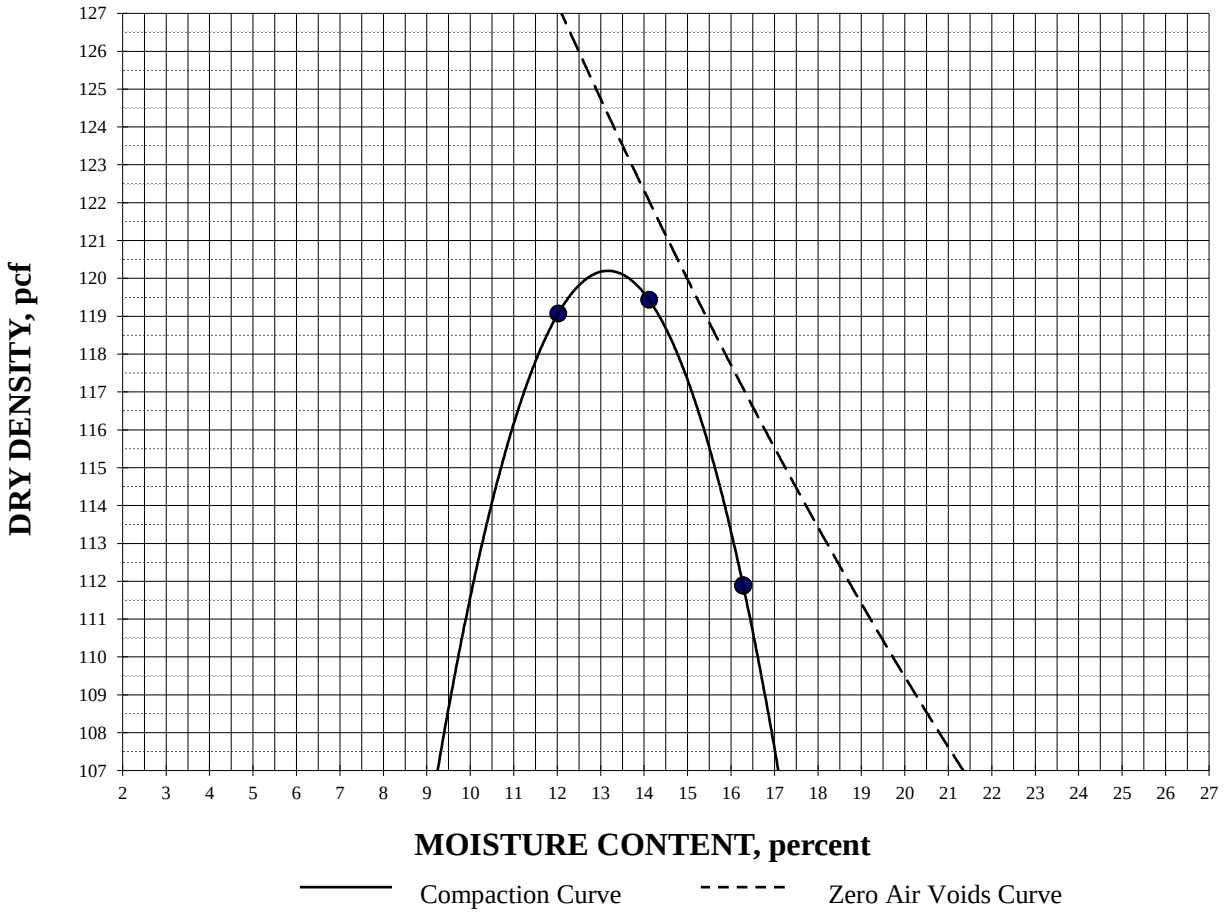
Dark Brown Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	0
#4	0

MAXIMUM DRY DENSITY: 120.2 pcf

OPTIMUM MOISTURE: 13.2%



Oxnard Airport - Runway and Taxiway
Rehabilitation / Reconstruction

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.70 (assumed)

January 16, 2019

CBR #3 with 3% Lime added; Boring #5 @ 2.0 - 4.0'

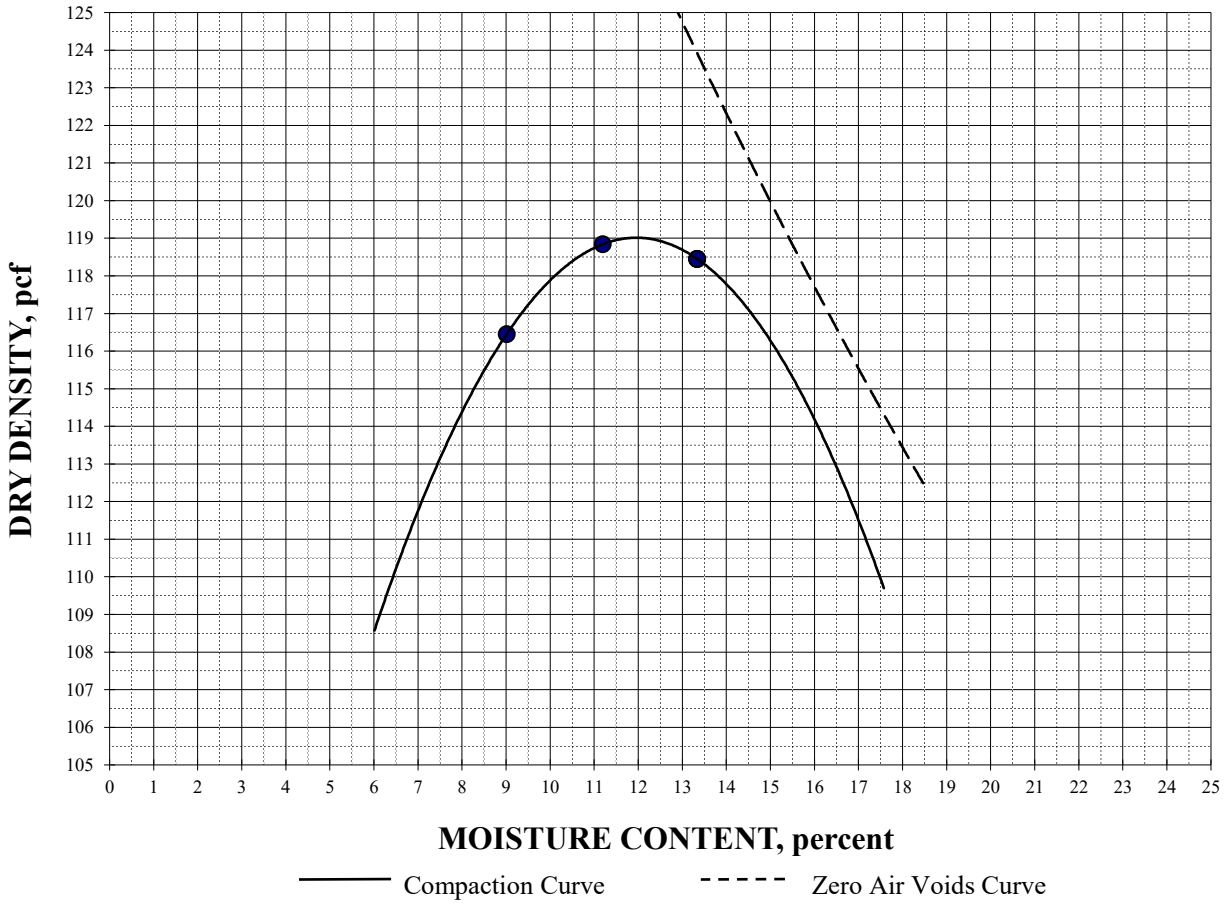
Dark Brown Silty Sand (SM)

SIEVE DATA:

Sieve Size	% Retained
3/4"	0
3/8"	0
#4	0

MAXIMUM DRY DENSITY: 119.0 pcf

OPTIMUM MOISTURE: 12.0%



Oxnard Airport - Runway and Taxiway
Rehabilitation / Reconstruction

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.70 (assumed)

January 16, 2019

CBR #3 with 5% Lime added; Boring #5 @ 2.0 - 4.0'

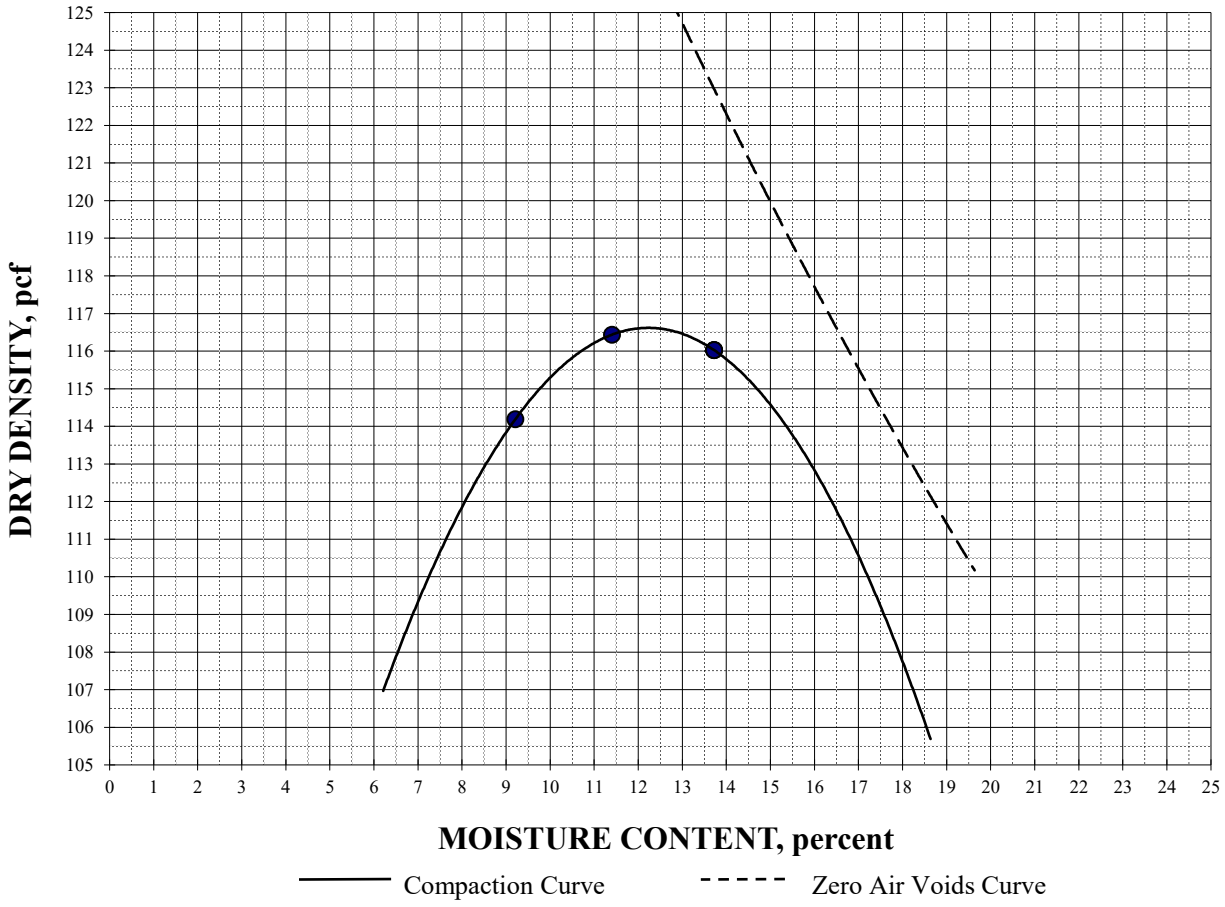
Dark Brown Silty Sand (SM)

SIEVE DATA:

Sieve Size	% Retained
3/4"	0
3/8"	0
#4	0

MAXIMUM DRY DENSITY: 116.6 pcf

OPTIMUM MOISTURE: 12.2%



Oxnard Airport - Runway and Taxiway
Rehabilitation / Reconstruction

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.70 (assumed)

January 16, 2019

CBR #3 with 7% Lime added; Boring #5 @ 2.0 - 4.0'

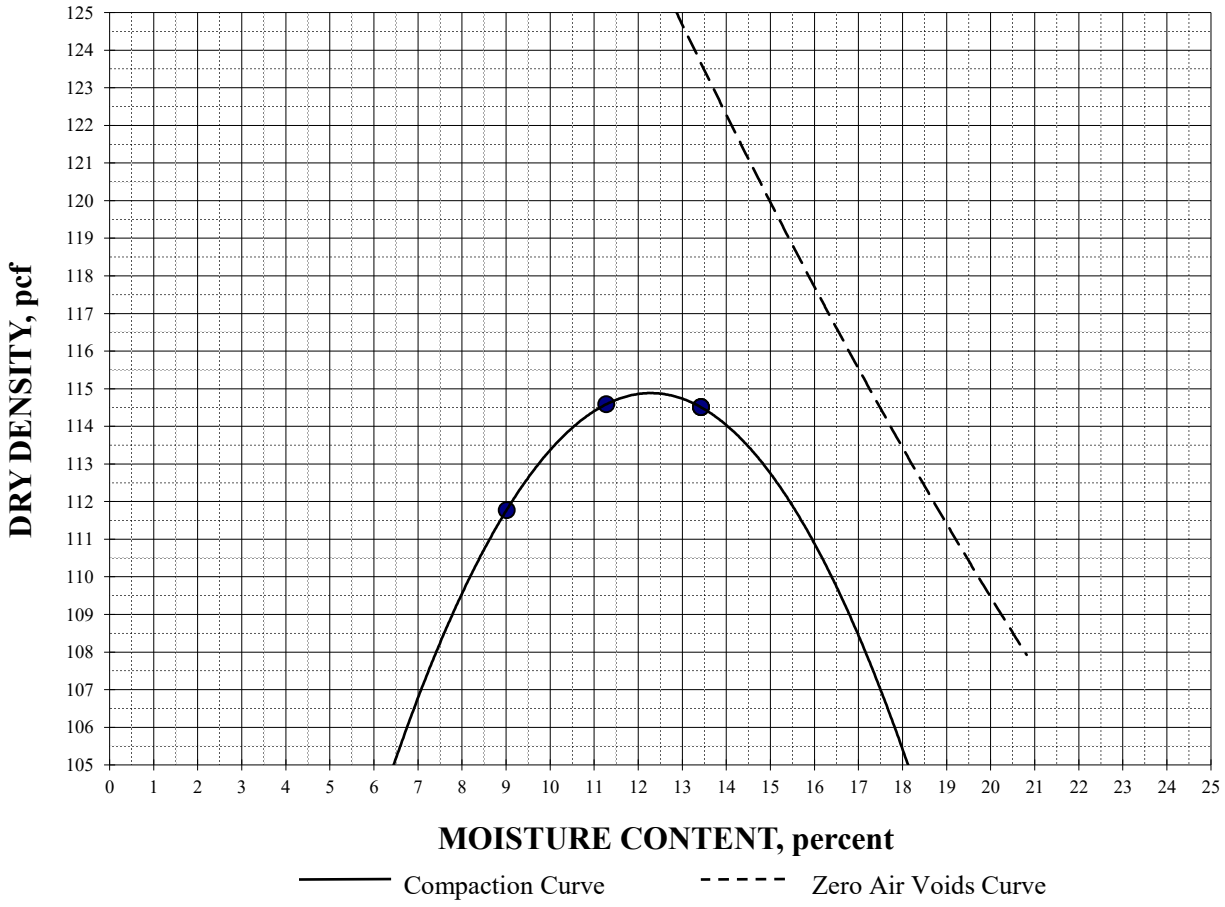
Dark Brown Silty Sand (SM)

SIEVE DATA:

Sieve Size	% Retained
3/4"	0
3/8"	0
#4	0

MAXIMUM DRY DENSITY: 114.9 pcf

OPTIMUM MOISTURE: 12.3%



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: C

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.65 (assumed)

January 8, 2019

CBR #4; Boring #3 @ 0.5 - 1.0'

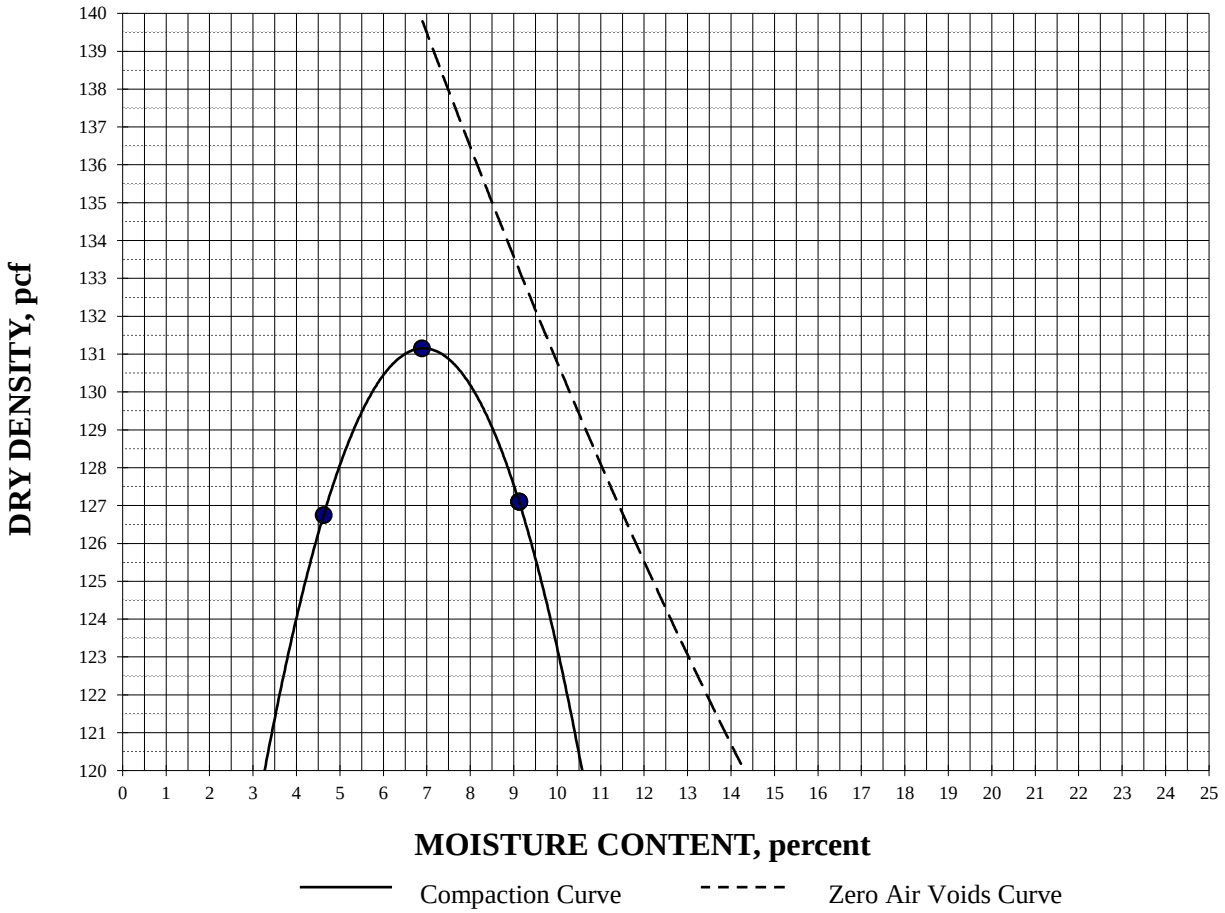
Brown Clayey Sand with Gravel (SC)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	7
#4	16

MAXIMUM DRY DENSITY: 131.2 pcf

OPTIMUM MOISTURE: 6.9%



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.70 (assumed)

January 8, 2019

CBR #5; Boring #36 @ 2.5 - 5.0'

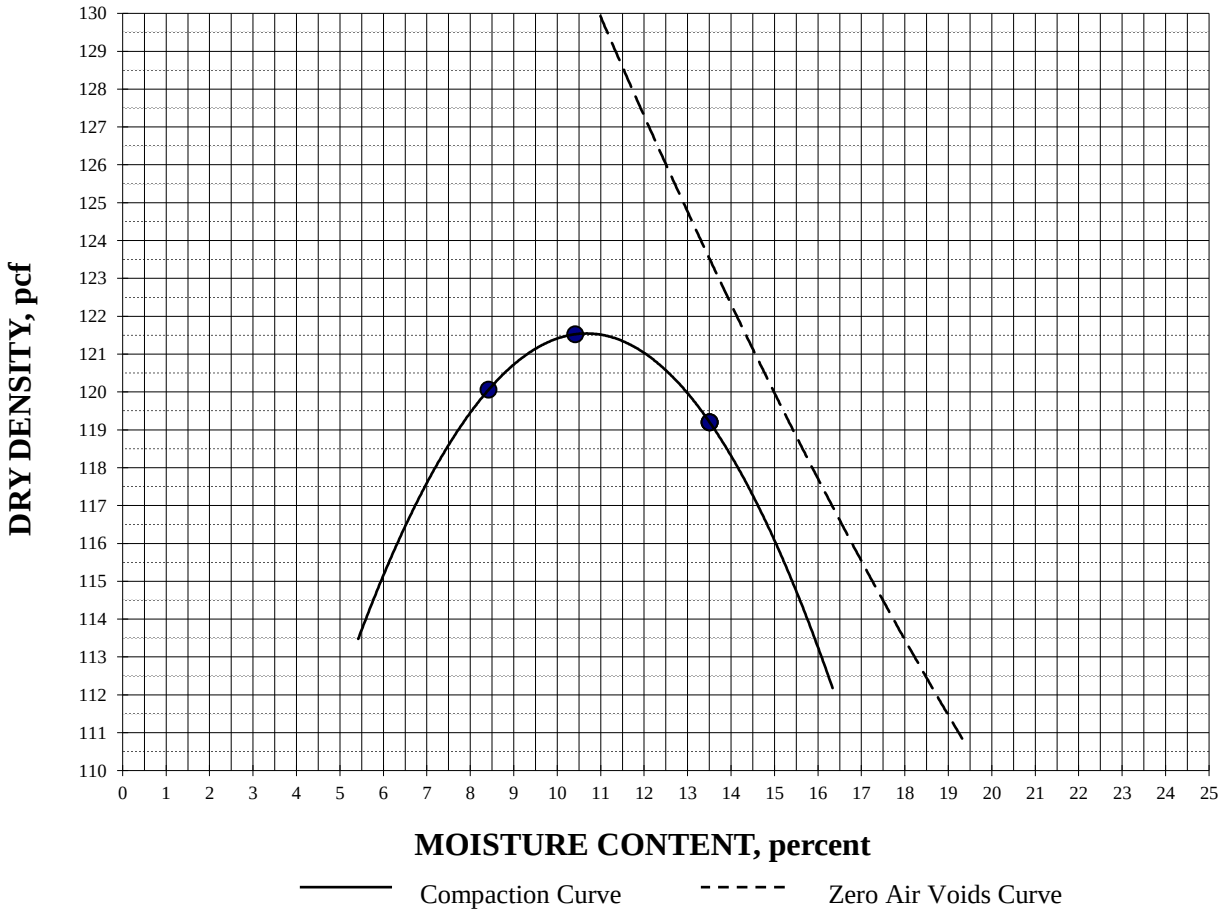
Dark Brown Sandy Lean Clay (CL)

MAXIMUM DRY DENSITY: 121.5 pcf

OPTIMUM MOISTURE: 10.7%

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	0
#4	2



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.70 (assumed)

January 16, 2019

CBR #6 with 3% Lime added; Boring #27 @ 2.0 - 4.0'

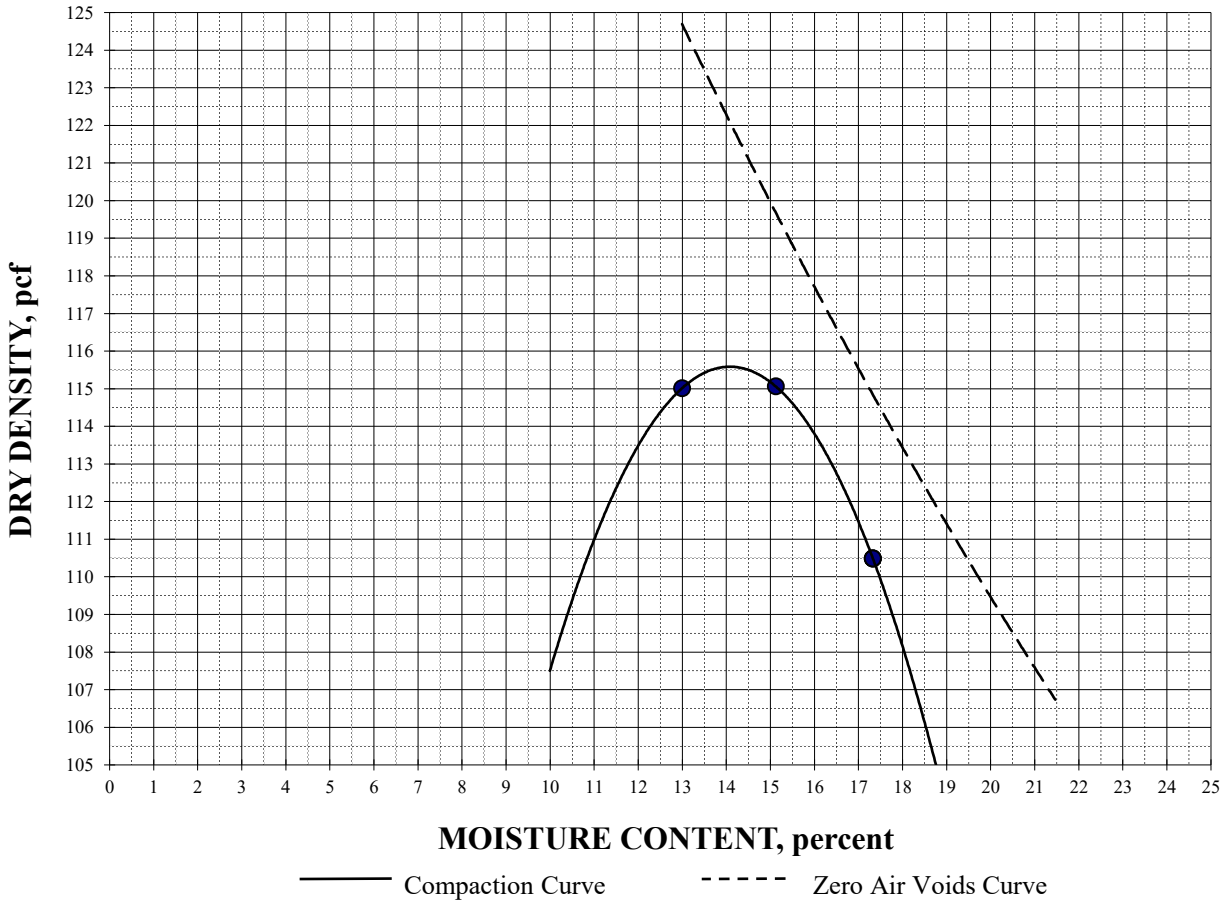
Dark Brown Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained
3/4"	0
3/8"	0
#4	1

MAXIMUM DRY DENSITY: 115.6 pcf

OPTIMUM MOISTURE: 14.1%



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.70 (assumed)

January 16, 2019

CBR #6 with 5% Lime added; Boring #27 @ 2.0 - 4.0'

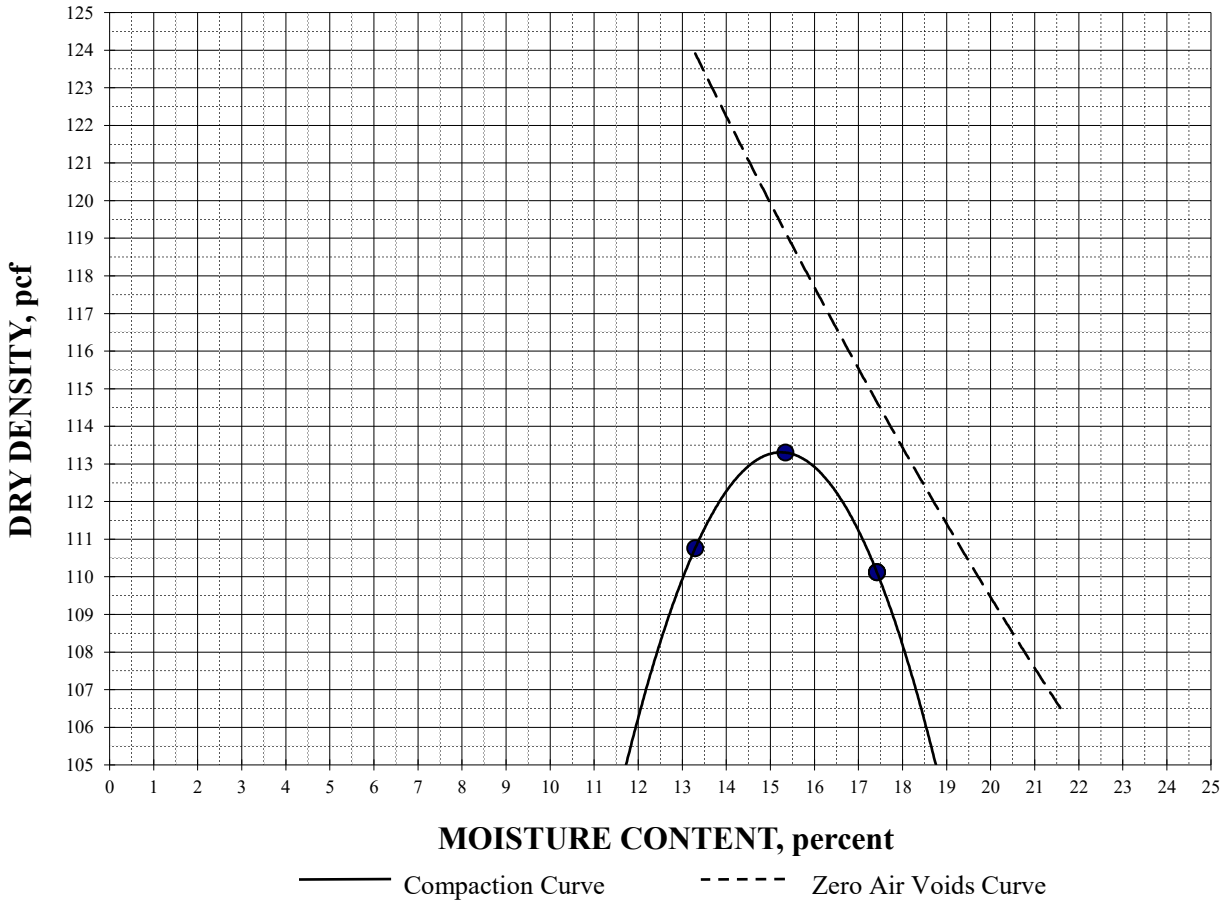
Dark Brown Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained
3/4"	0
3/8"	0
#4	1

MAXIMUM DRY DENSITY: 113.3 pcf

OPTIMUM MOISTURE: 15.2%



Oxnard Airport - Runway and Taxiway
Rehabilitation / Reconstruction

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.70 (assumed)

January 16, 2019

CBR #6 with 7% Lime added; Boring #27 @ 2.0 - 4.0'

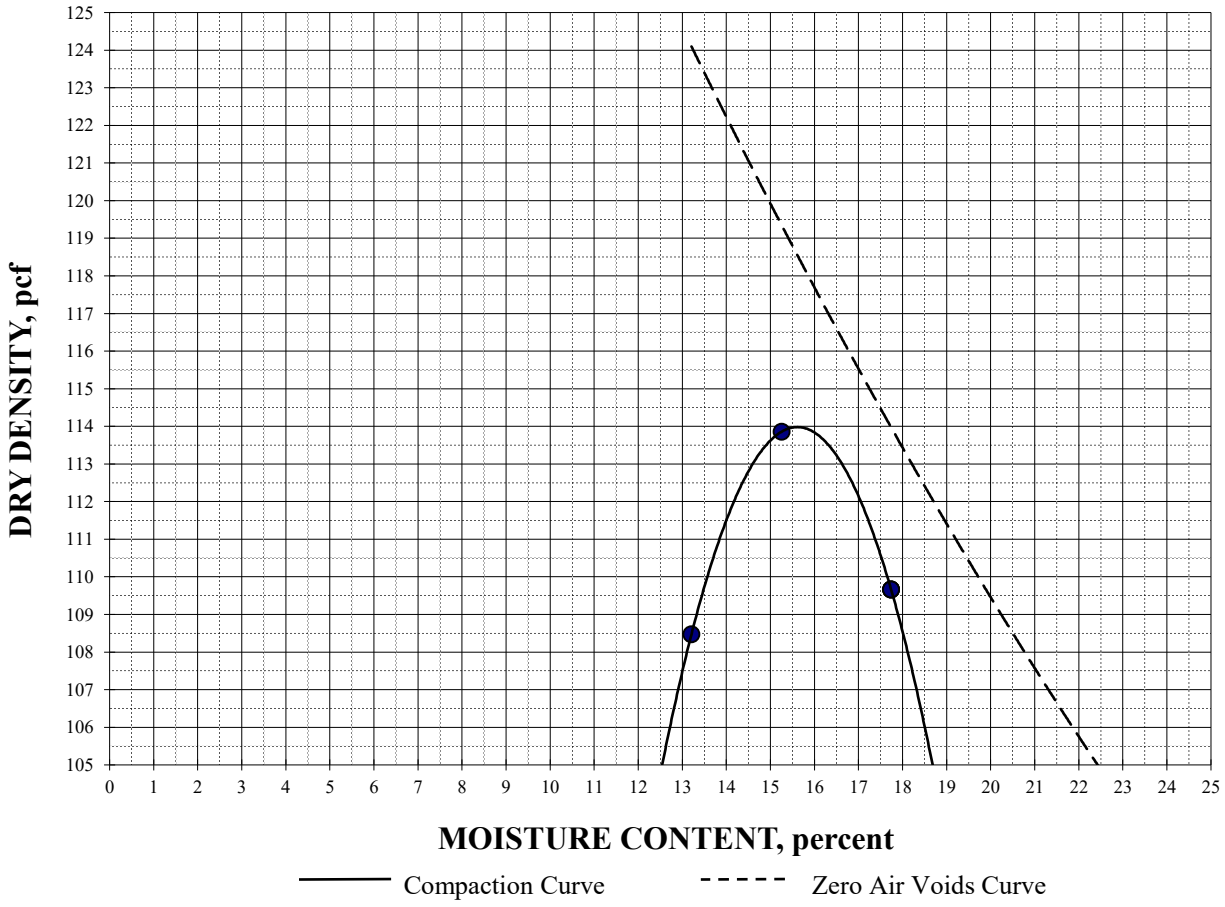
Dark Brown Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained
3/4"	0
3/8"	0
#4	1

MAXIMUM DRY DENSITY: 114.0 pcf

OPTIMUM MOISTURE: 15.6%



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.70 (assumed)

January 8, 2019

CBR #7; Boring #23 @ 3.5 - 5.0'

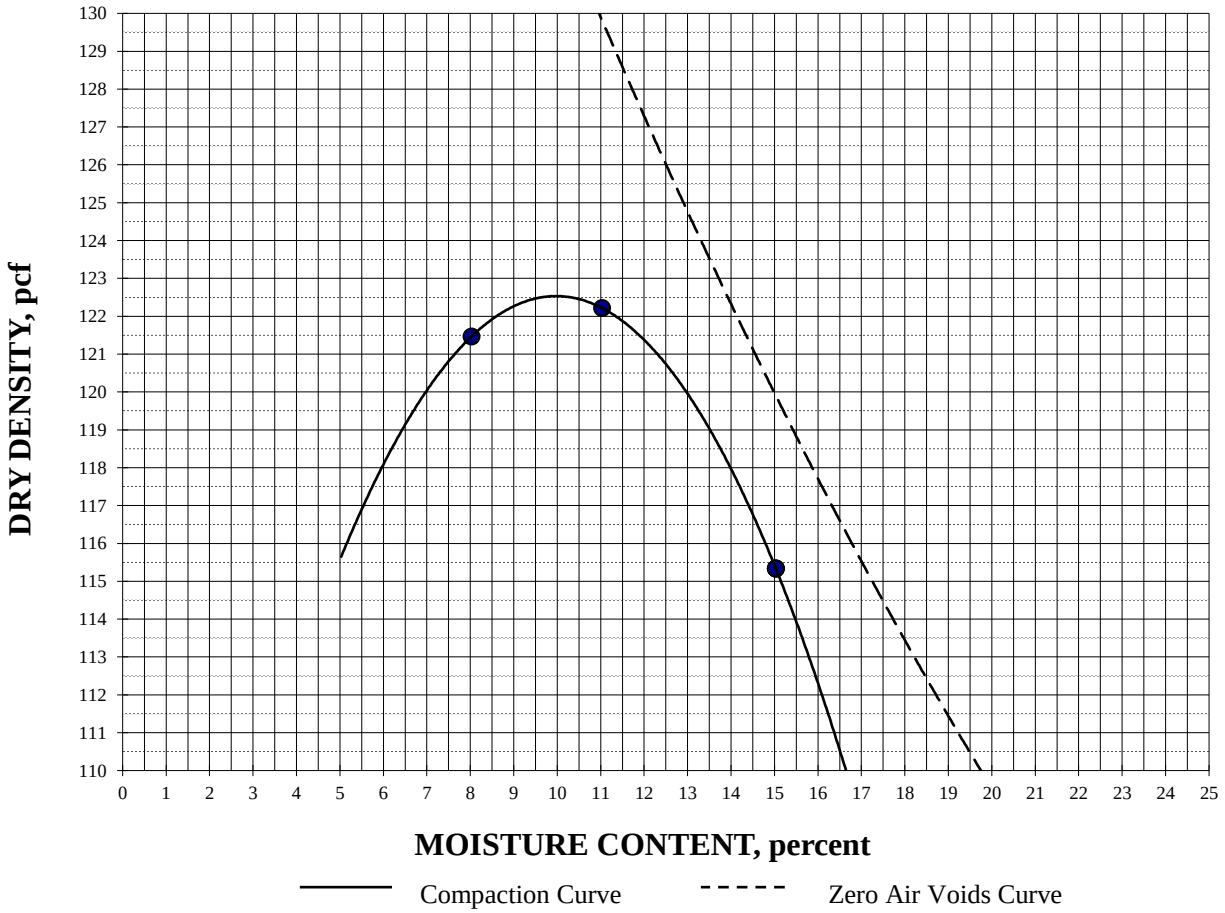
Brown Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	0
#4	0

MAXIMUM DRY DENSITY: 122.5 pcf

OPTIMUM MOISTURE: 10.0%



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.65 (assumed)

January 8, 2019

CBR #8; Boring #29 @ 2.0 - 5.0'

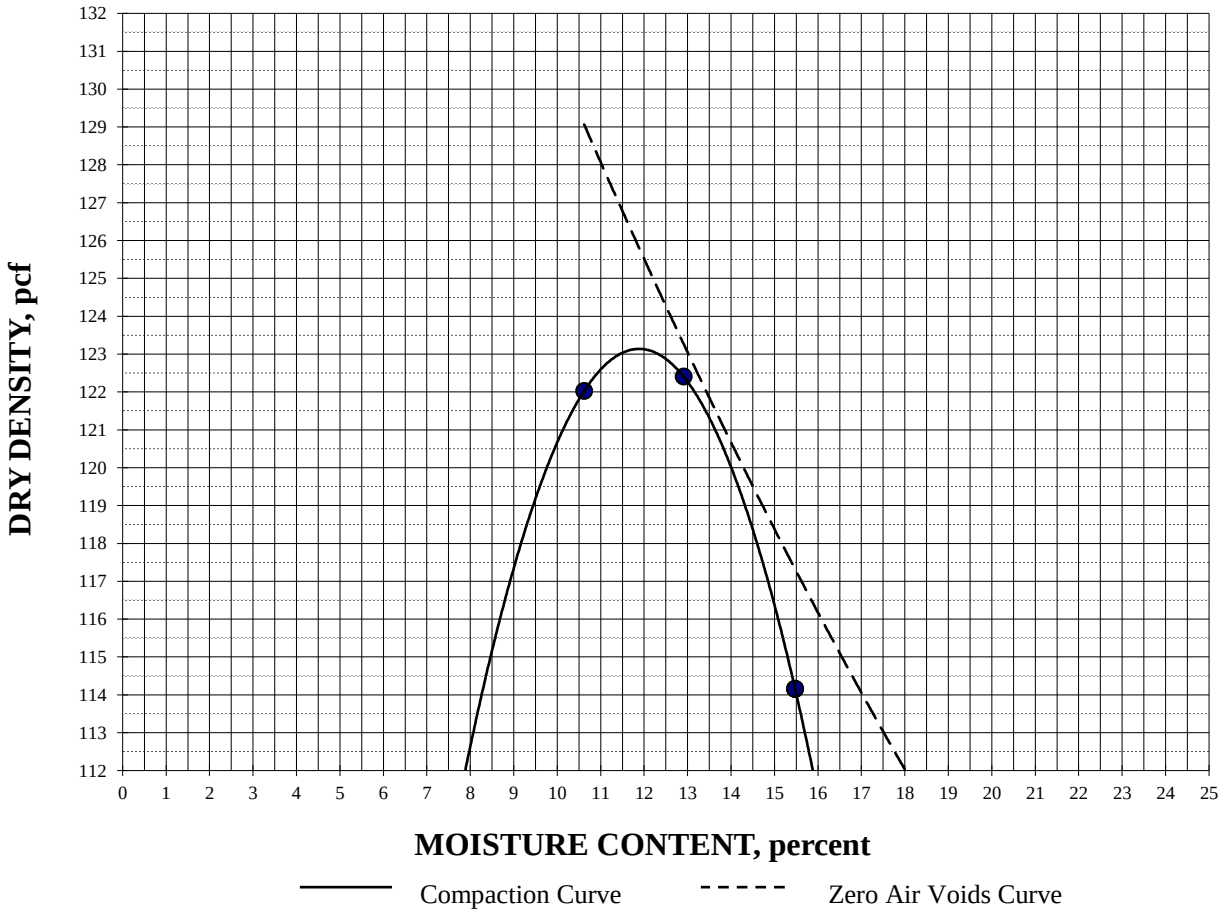
Brown / Gray Mottled Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	0
#4	1

MAXIMUM DRY DENSITY: 123.1 pcf

OPTIMUM MOISTURE: 11.9%



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.70 (assumed)

January 8, 2019

CBR #9; Boring #21 @ 1.5 - 3.0'

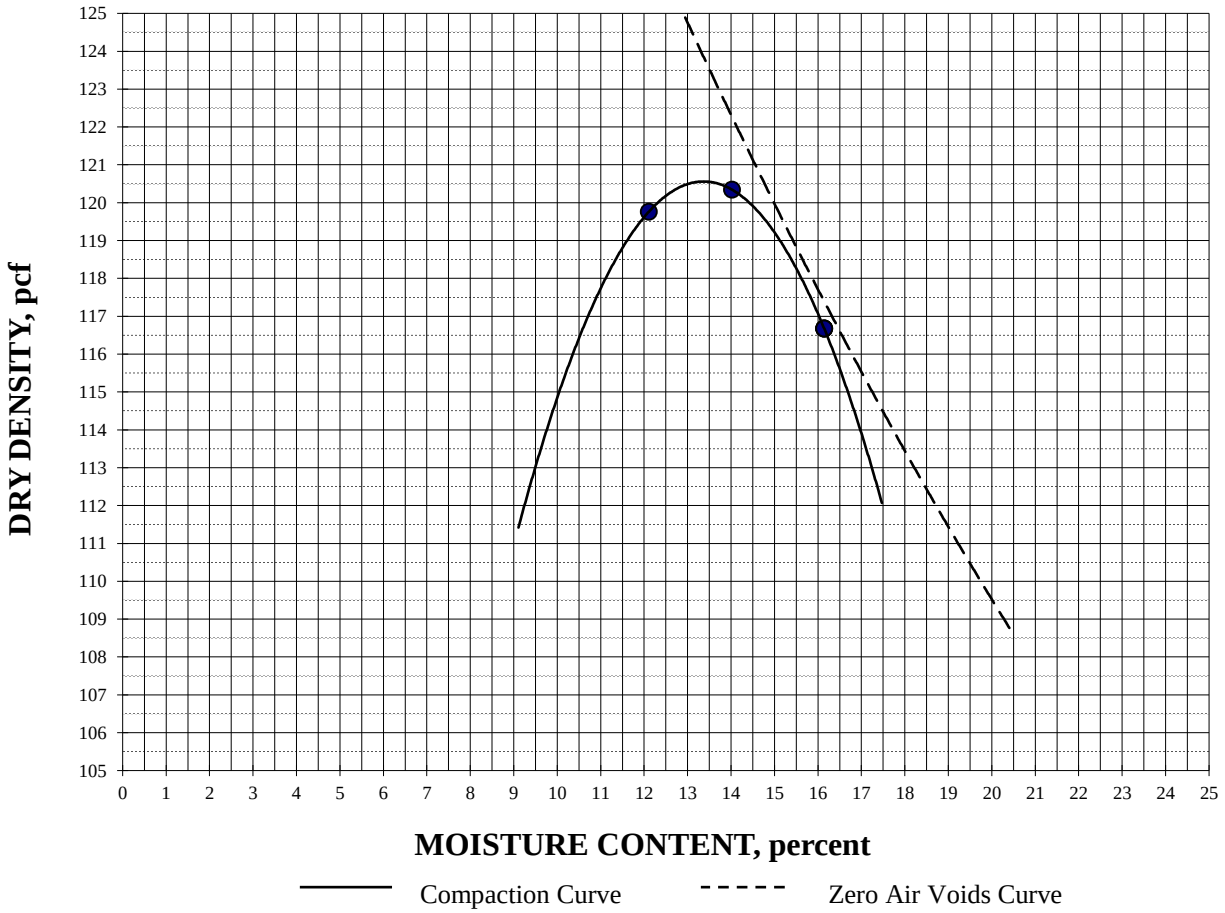
Brown Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	1
#4	1

MAXIMUM DRY DENSITY: 120.6 pcf

OPTIMUM MOISTURE: 13.4%



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.70 (assumed)

January 8, 2019

CBR #11; Boring #16 @ 2.0 - 4.0'

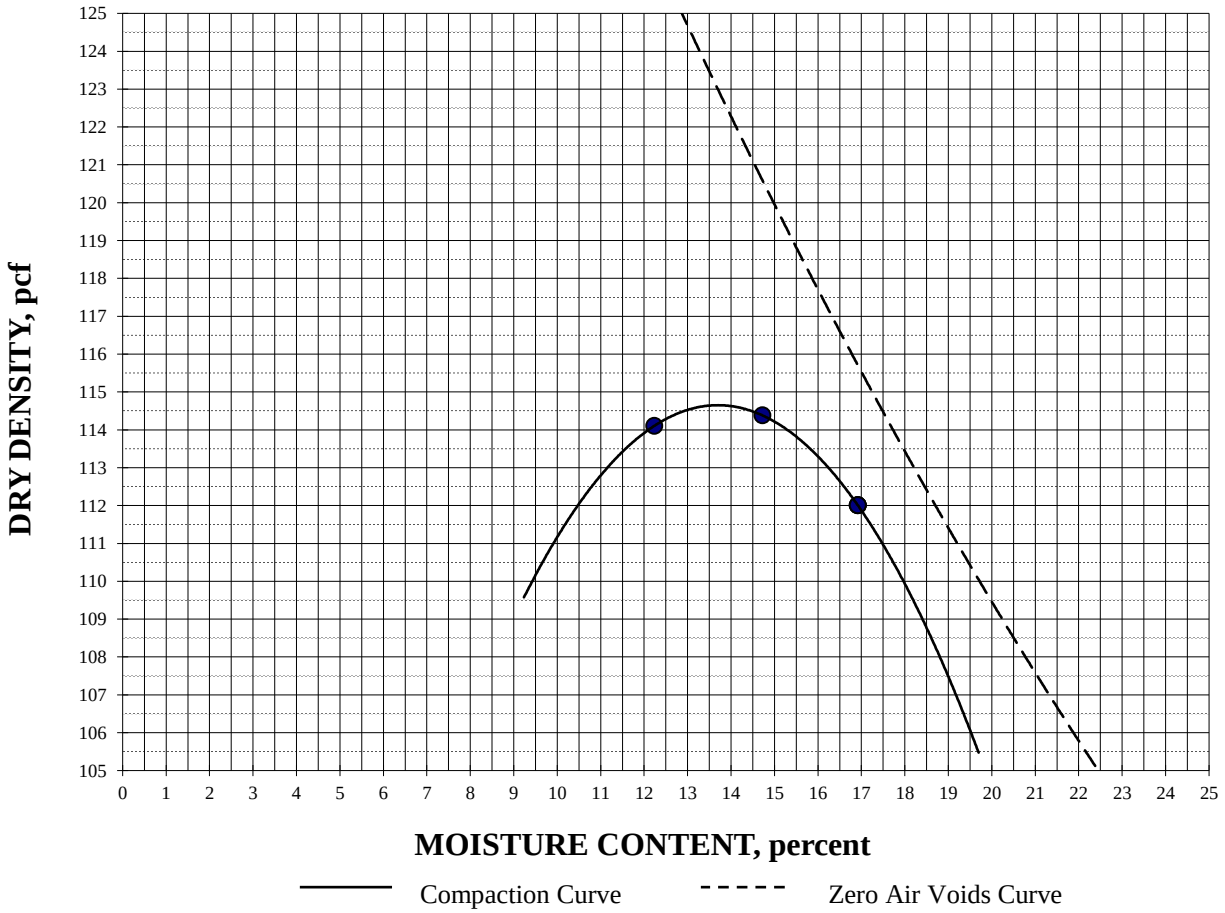
Dark Brown Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	0
#4	1

MAXIMUM DRY DENSITY: 114.7 pcf

OPTIMUM MOISTURE: 13.7%



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.70 (assumed)

January 8, 2019

CBR #12; Boring #13 @ 2.0 - 4.0'

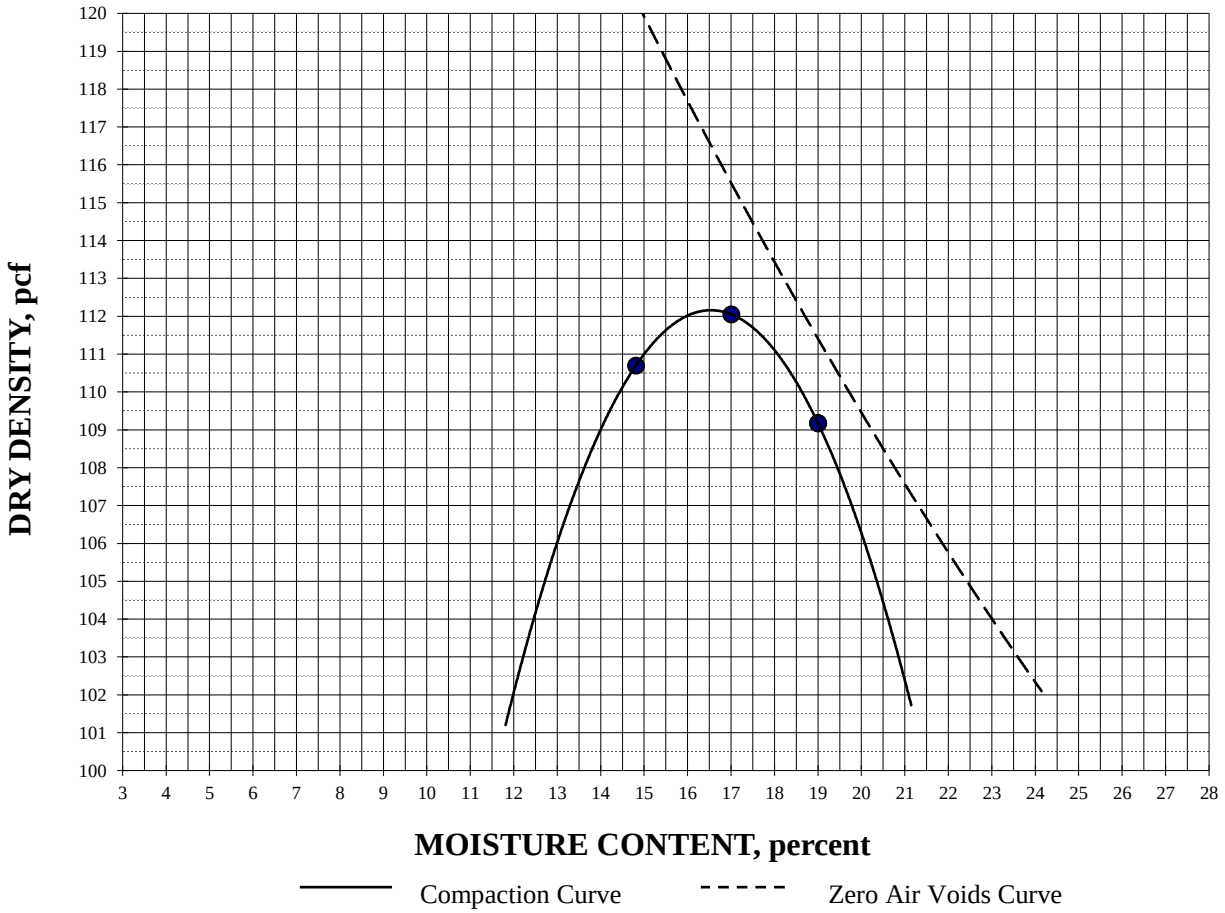
Dark Brown Sandy Lean Clay (CL)

MAXIMUM DRY DENSITY: 112.2 pcf

OPTIMUM MOISTURE: 16.5%

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	0
#4	0



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.65 (assumed)

January 8, 2019

CBR #13; Boring #40 @ 1.5 - 3.5'

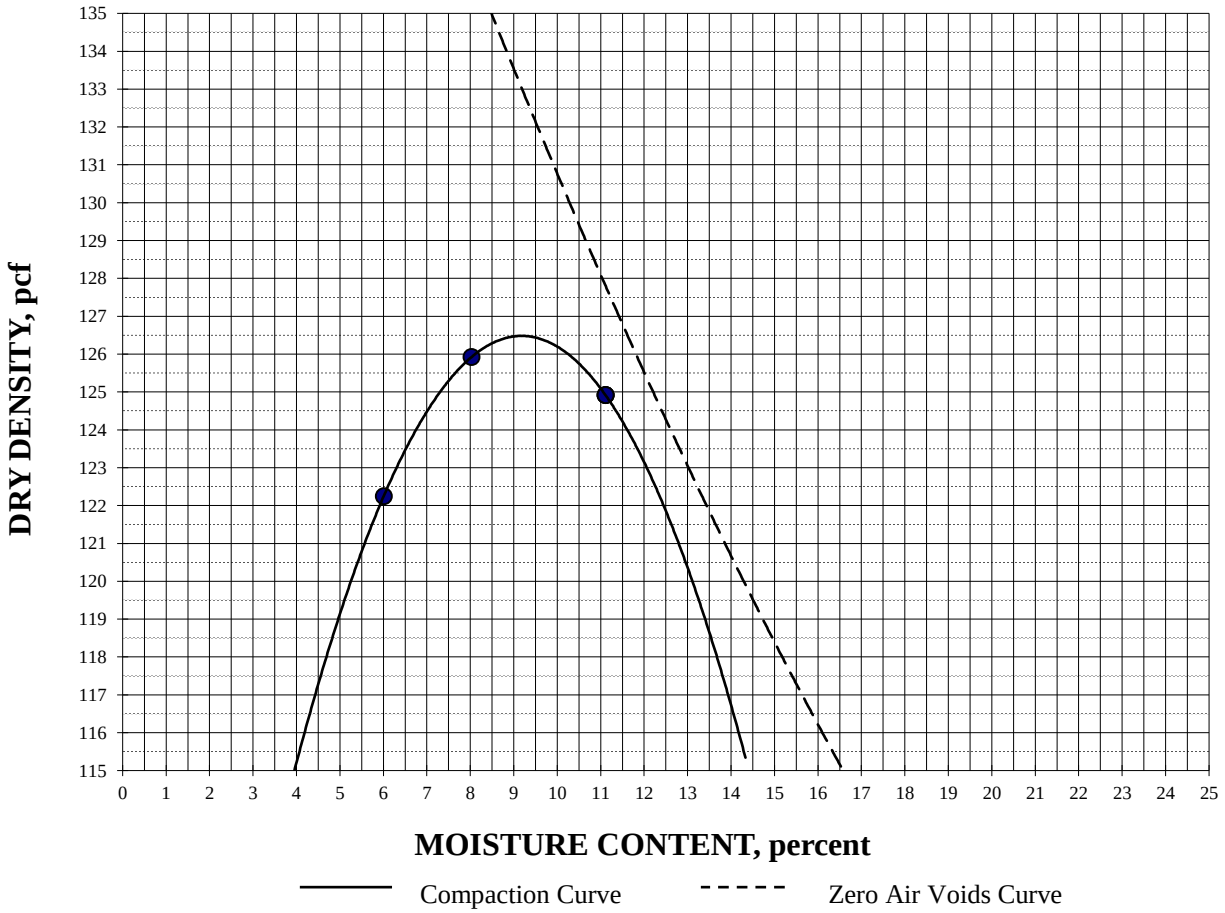
Brown Silty Sand (SM)

MAXIMUM DRY DENSITY: 126.5 pcf

OPTIMUM MOISTURE: 9.2%

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	0
#4	3



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: A

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.70 (assumed)

January 8, 2019

CBR #14; Boring #39 @ 2.0 - 5.0'

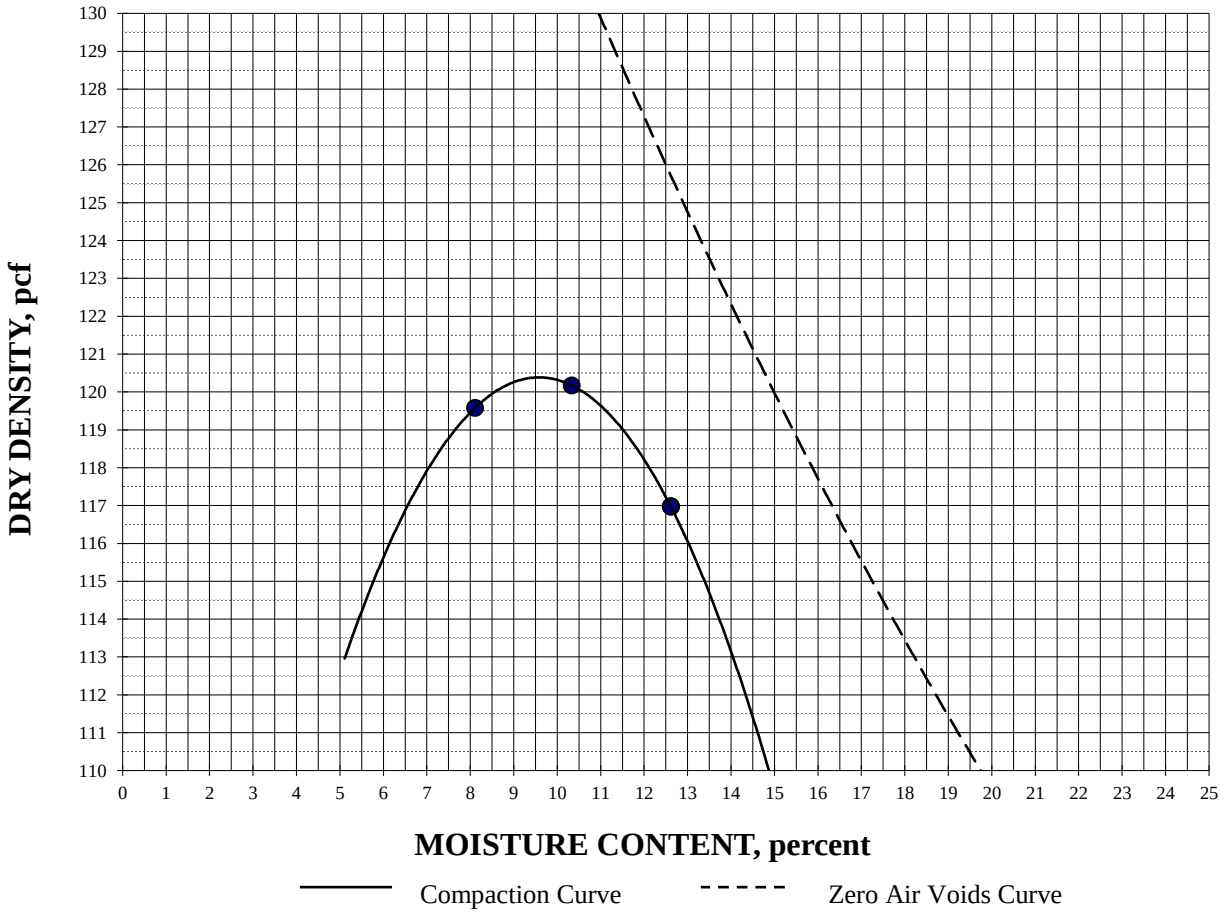
Brown Sandy Fat Clay (CH)

MAXIMUM DRY DENSITY: 120.4 pcf

OPTIMUM MOISTURE: 9.6%

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	0
#4	0



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: C

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.65 (assumed)

January 8, 2019

CBR #15; Boring #17 @ 0.5 - 1.5'

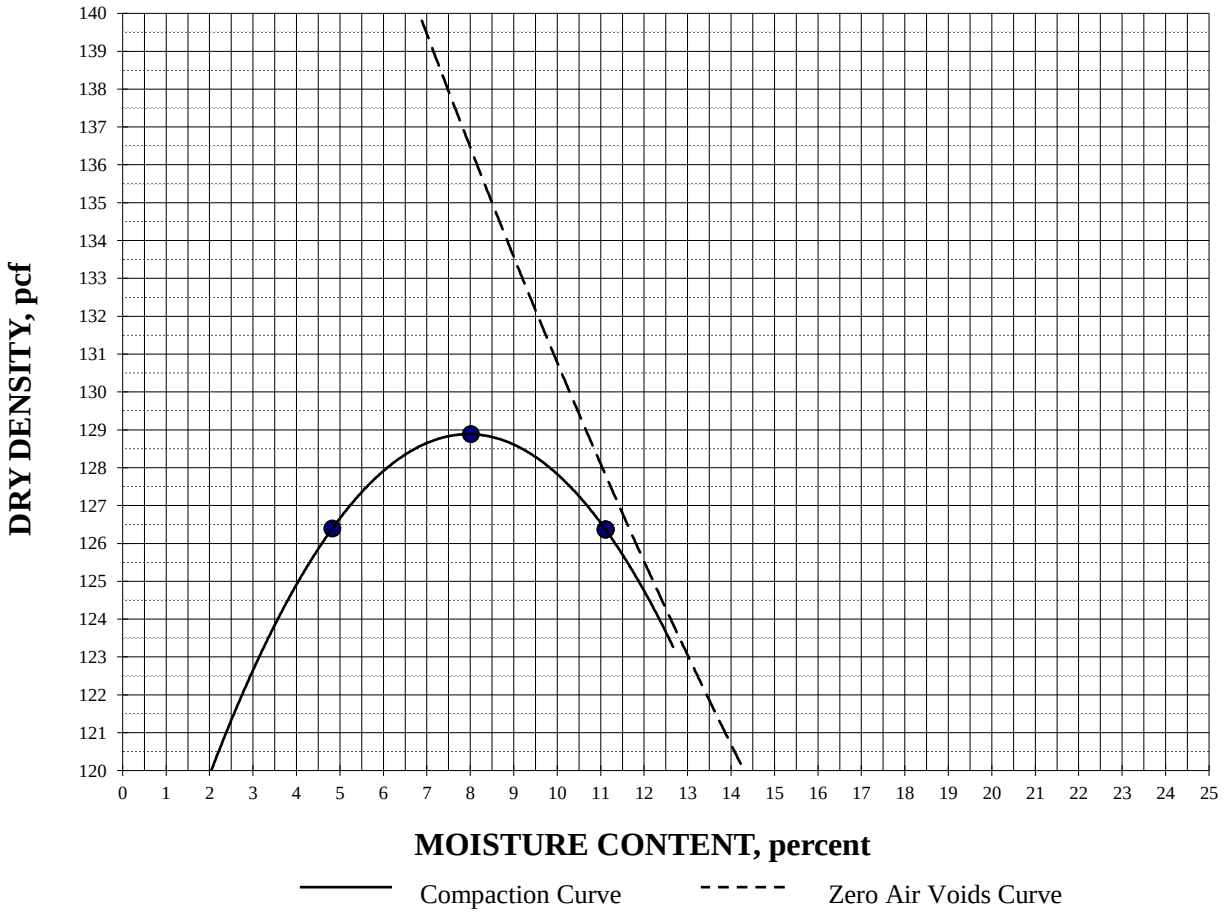
Brown Clayey Sand with Gravel (SC)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	10
3/8"	26
#4	41

MAXIMUM DRY DENSITY: 128.9 pcf

OPTIMUM MOISTURE: 8.0%



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: C

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.65 (assumed)

January 8, 2019

CBR #16; Boring #28 @ 0.5 - 1.5'

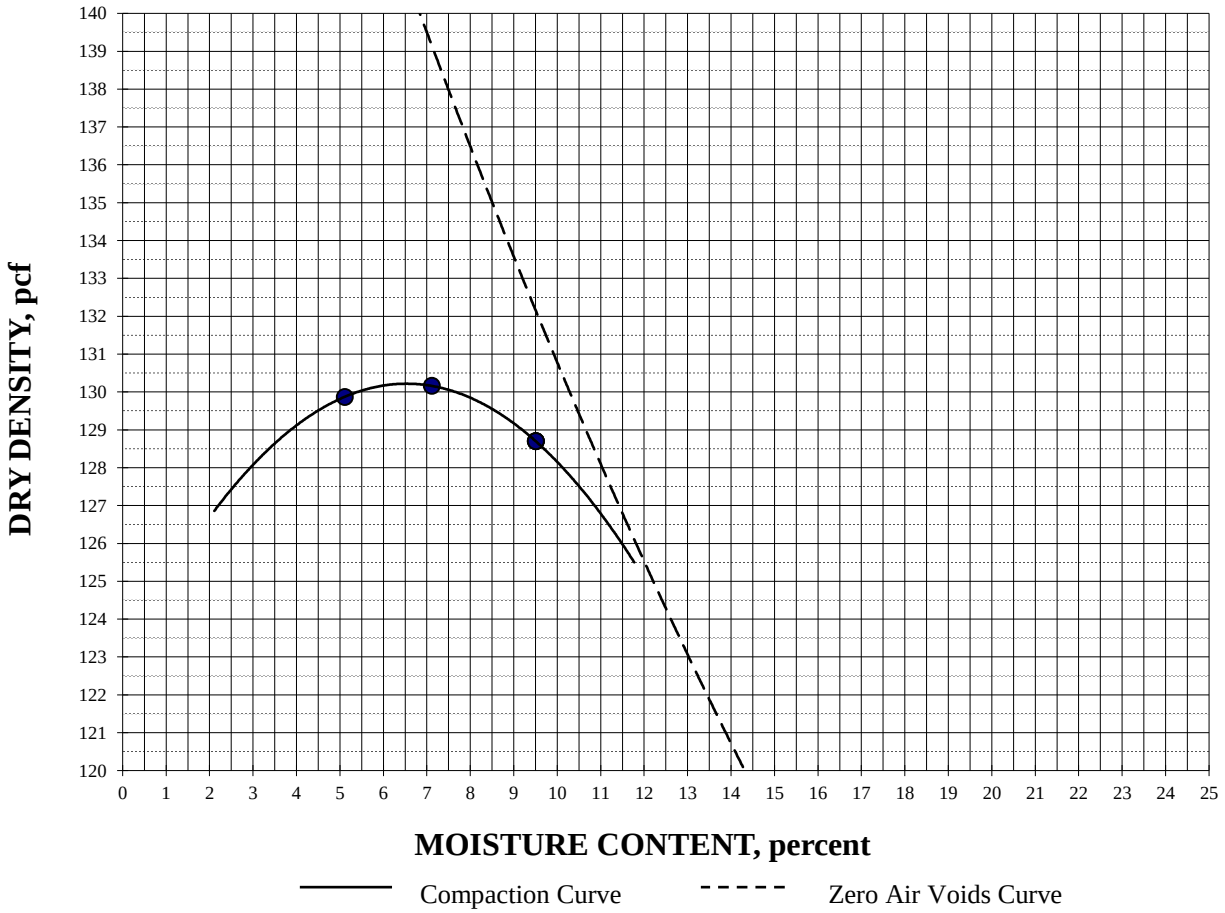
Brown Silty Gravel with Sand (GM)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	10
3/8"	29
#4	46

MAXIMUM DRY DENSITY: 130.2 pcf

OPTIMUM MOISTURE: 6.5%



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: C

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.65 (assumed)

January 8, 2019

CBR #17; Boring #14 @ 0.5 - 1.5'

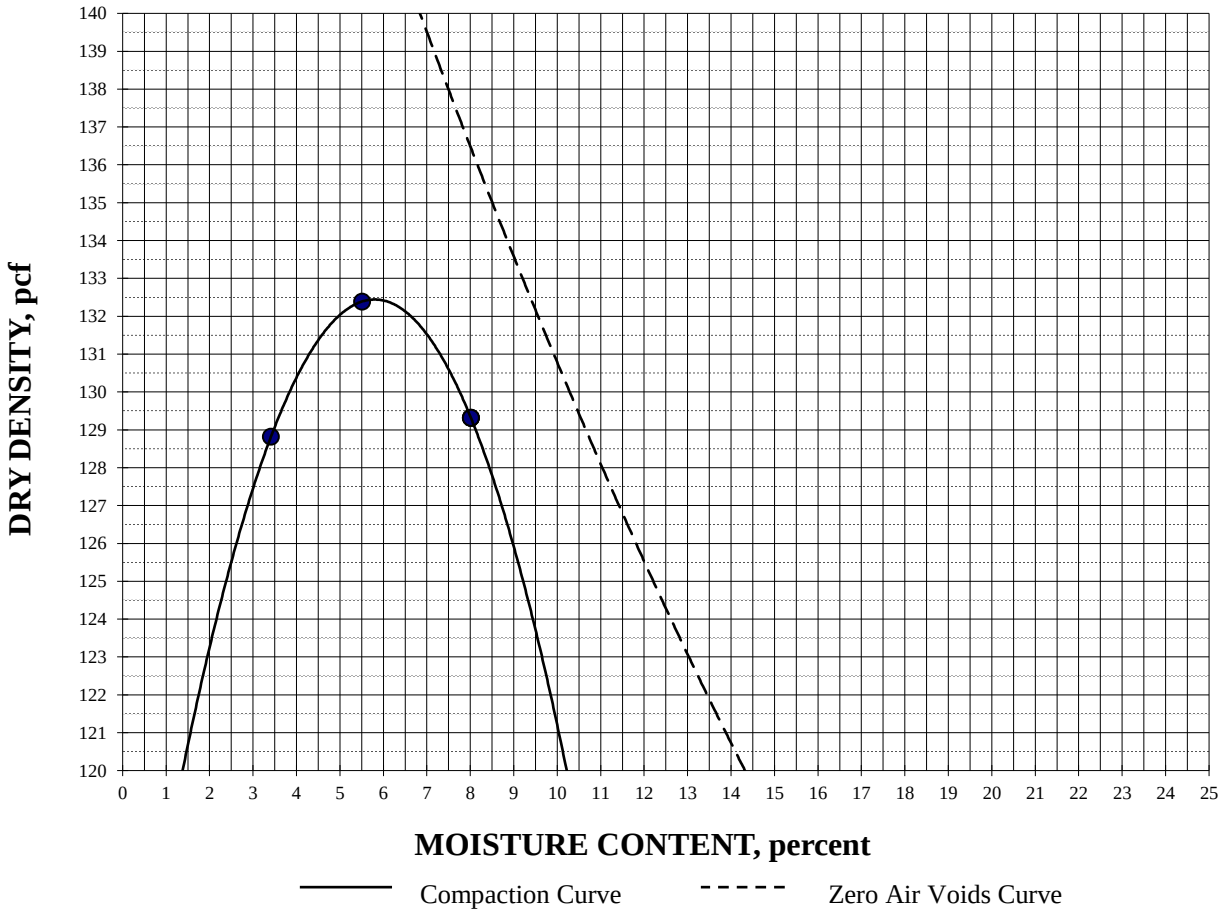
Brown Silty Sand with Gravel (SM)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	7
3/8"	22
#4	35

MAXIMUM DRY DENSITY: 132.4 pcf

OPTIMUM MOISTURE: 5.8%



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #1; Boring #1 @ 2.0 - 5.0'
Dark Brown Sandy Lean Clay (CL)

January 8, 2019

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	106.8	112.2	112.6
Moisture content, %, before soak	7.9	10.9	13.9
Moisture content, %, after soak, avg.	15.3	16.8	18.8
Moisture content, %, after soak, top 1"	20.3	17.7	16.8
Expansion, %, 96 hour soak	1.9	0.1	0.2
Bearing Ratio, 0.100" penetration	2.9	8.7	3.4

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	109.9	118.6	116.5
Moisture content, %, before soak	7.9	10.9	13.9
Moisture content, %, after soak, avg.	13.7	14.4	16.5
Moisture content, %, after soak, top 1"	18.6	16.5	14.2
Expansion, %, 96 hour soak	1.6	0.2	0.1
Bearing Ratio, 0.100" penetration	6.9	23.8	7.1

56 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	117.7	124.3	118.0
Moisture content, %, before soak	7.9	10.9	13.9
Moisture content, %, after soak, avg.	14.3	12.4	14.1
Moisture content, %, after soak, top 1"	15.7	13.0	14.0
Expansion, %, 96 hour soak	1.0	0.0	0.0
Bearing Ratio, 0.100" penetration	21.3	32.3	4.7

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

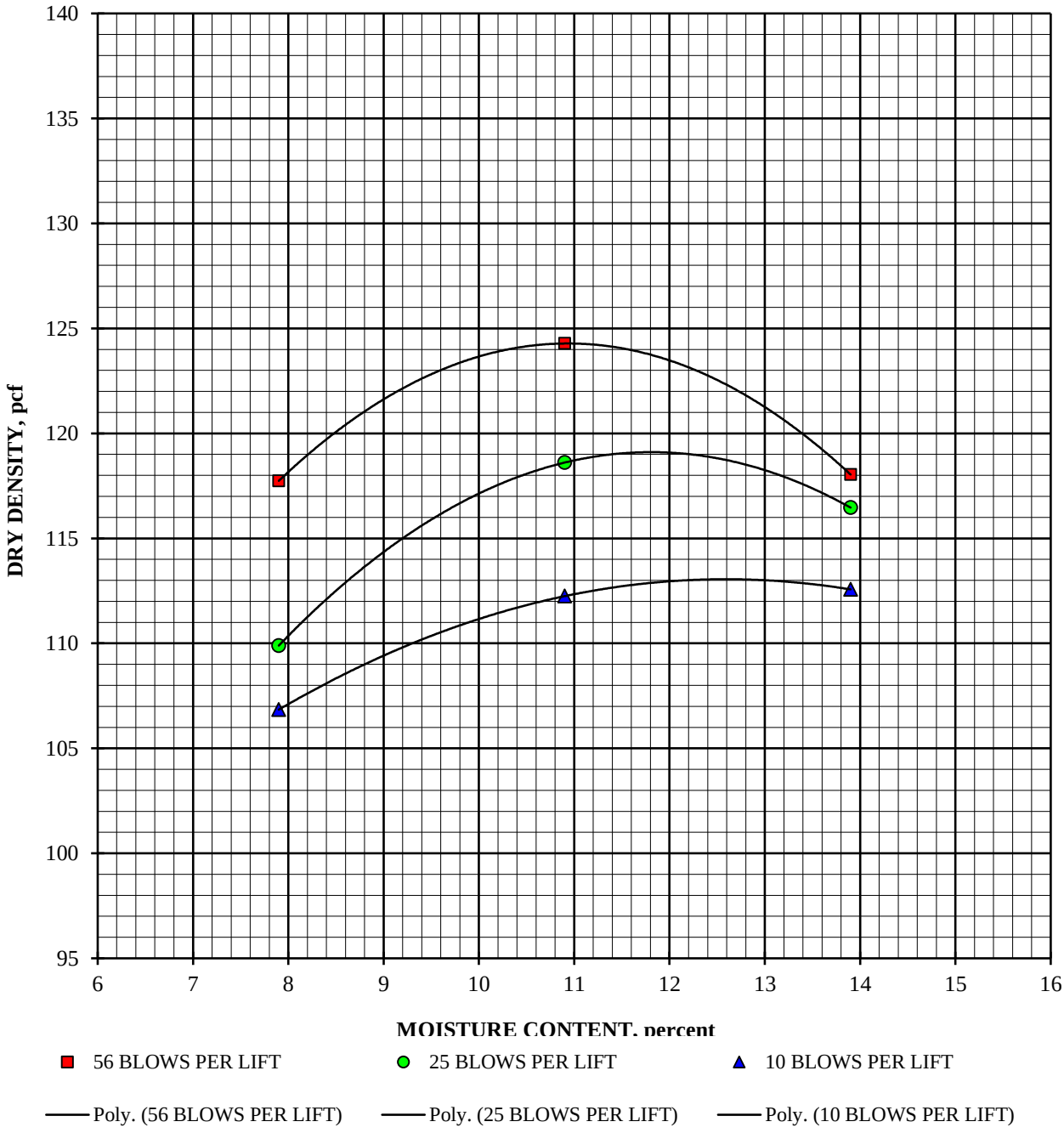
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #1; Boring #1 @ 2.0 - 5.0'

January 8, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

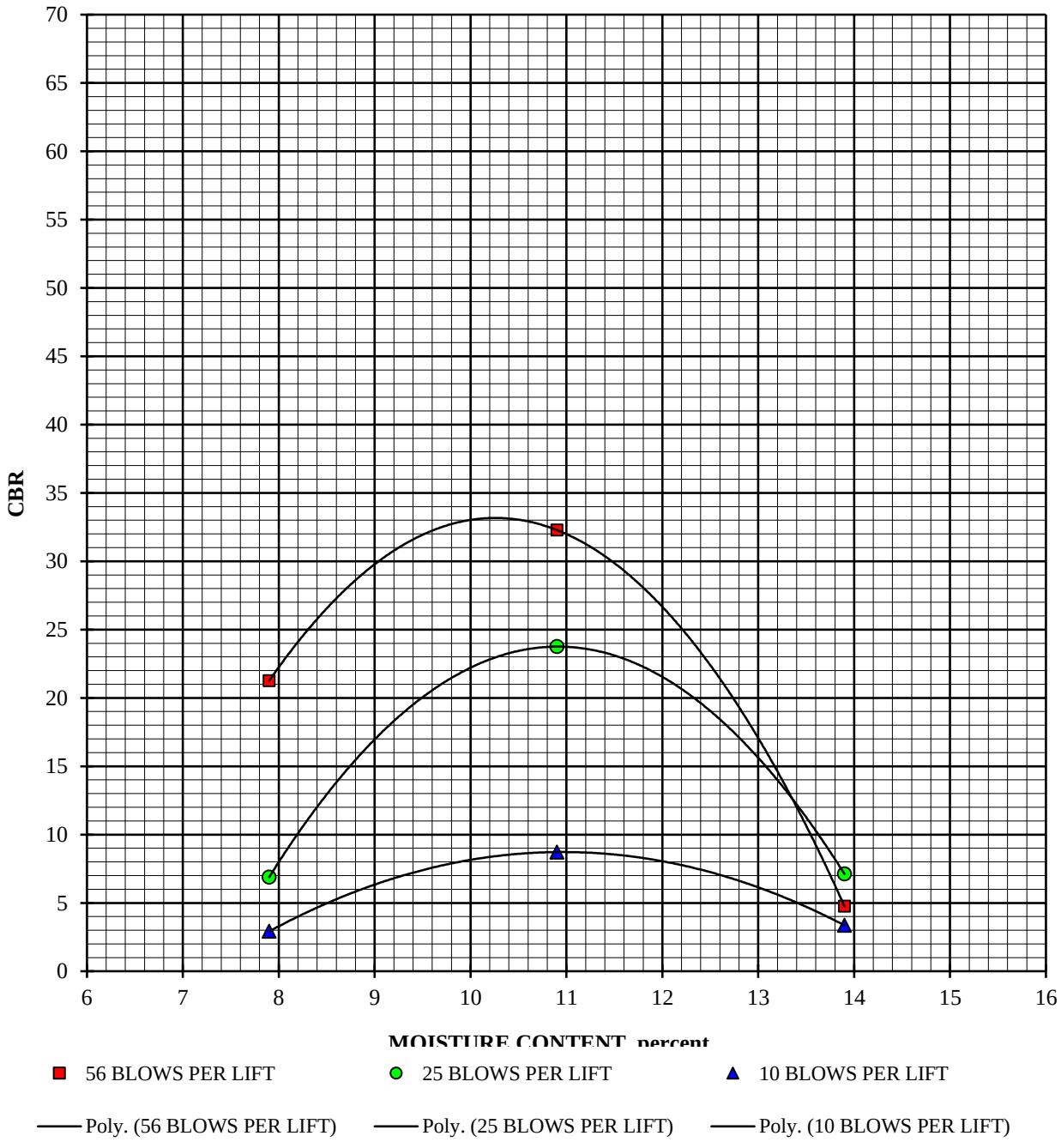
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #1; Boring #1 @ 2.0 - 5.0'

January 8, 2019

Dark Brown Sandy Lean Clay (CL)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

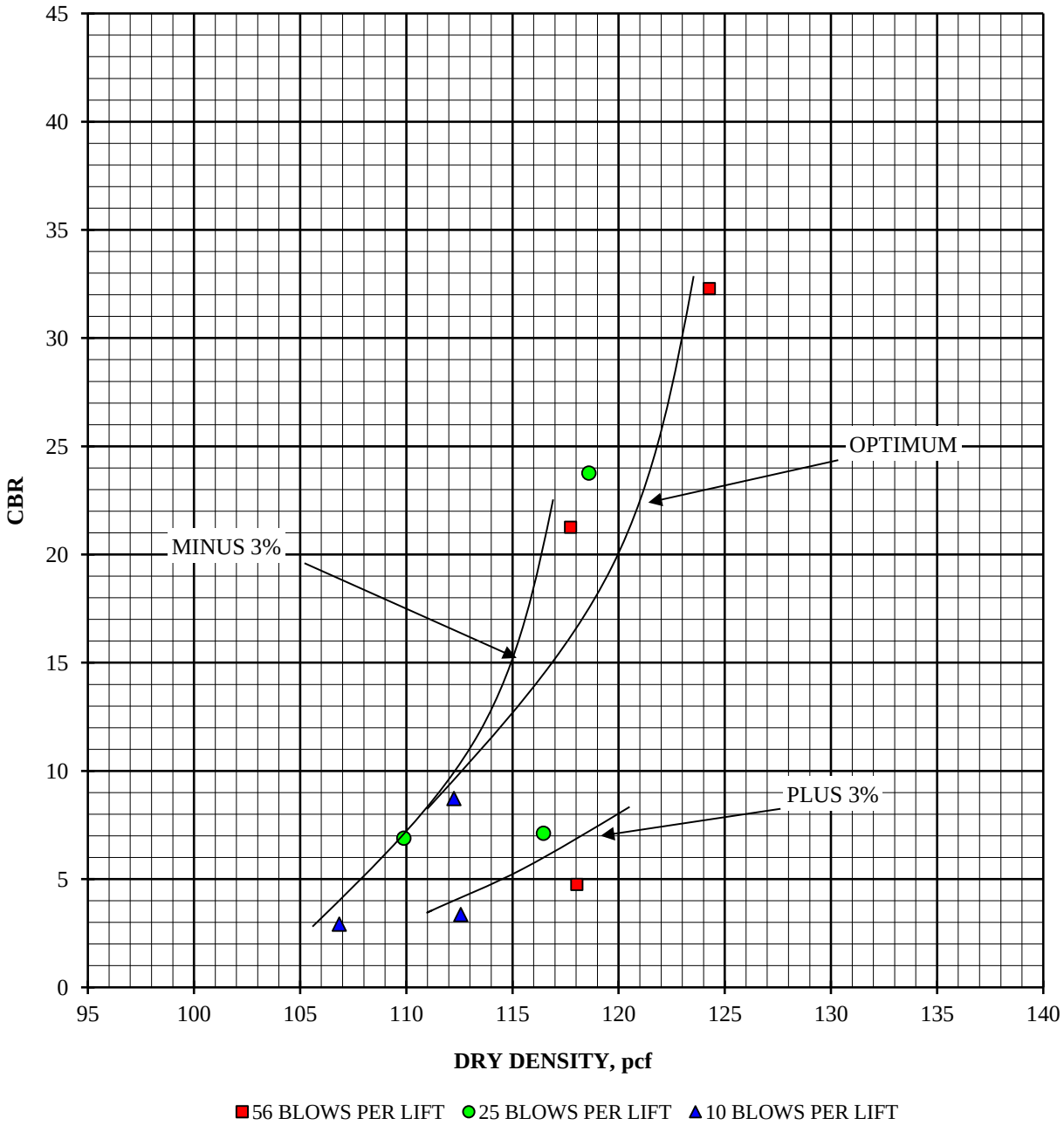
CBR #1; Boring #1 @ 2.0 - 5.0'

January 8, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

CBR#2; Boring #9 @ 3.0 - 5.0'
Dark Brown Sandy Lean Clay (CL)

January 8, 2019

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	105.5	112.6	112.1
Moisture content, %, before soak	11.2	14.2	17.2
Moisture content, %, after soak, avg.	21.9	17.8	19.8
Moisture content, %, after soak, top 1"	21.7	20.4	17.8
Expansion, %, 96 hour soak	1.6	0.7	0.0
Bearing Ratio, 0.100" penetration	3.2	9.1	4.1

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	112.2	117.7	113.2
Moisture content, %, before soak	11.2	14.2	17.2
Moisture content, %, after soak, avg.	19.9	16.0	18.2
Moisture content, %, after soak, top 1"	20.3	16.8	17.3
Expansion, %, 96 hour soak	0.9	0.0	0.0
Bearing Ratio, 0.100" penetration	7.6	11.9	4.3

56 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	117.7	120.0	111.9
Moisture content, %, before soak	11.2	14.2	17.2
Moisture content, %, after soak, avg.	19.0	15.5	18.1
Moisture content, %, after soak, top 1"	17.4	14.7	16.4
Expansion, %, 96 hour soak	1.1	0.4	0.0
Bearing Ratio, 0.100" penetration	9.1	14.9	3.4

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

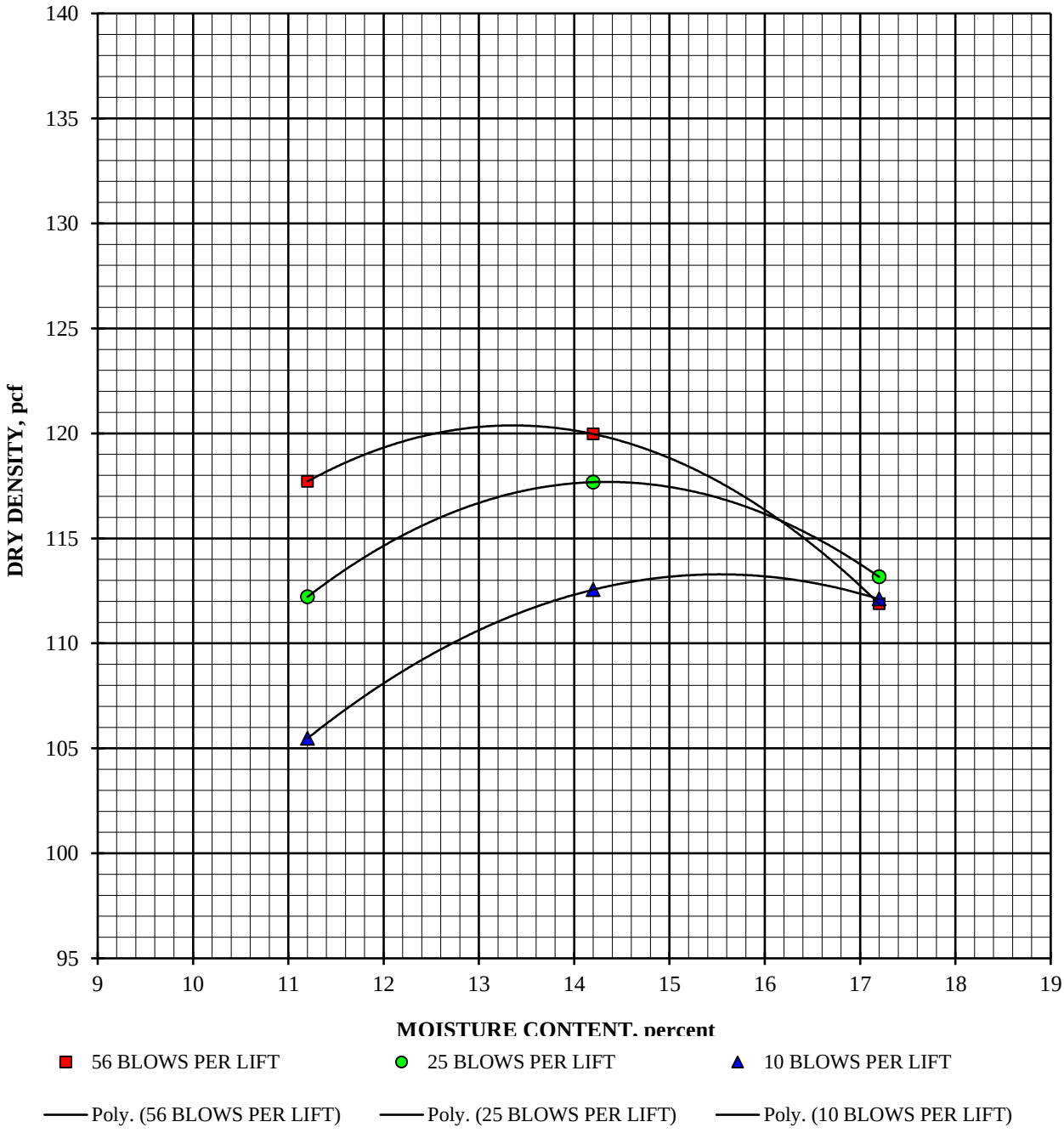
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #2; Boring #9 @ 3.0 - 5.0'

January 8, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

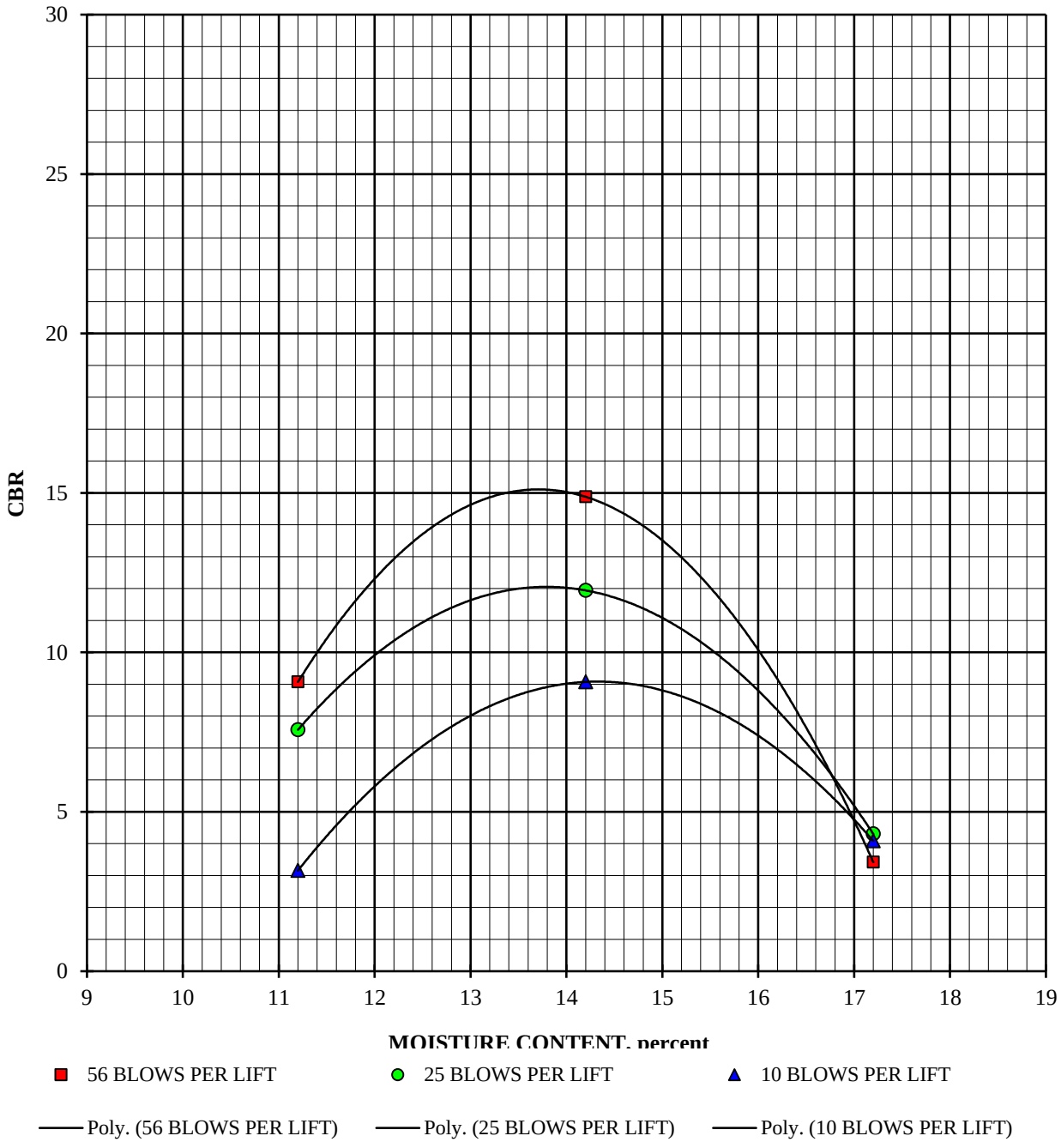
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #2; Boring #9 @ 3.0 - 5.0'

January 8, 2019

Dark Brown Sandy Lean Clay (CL)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

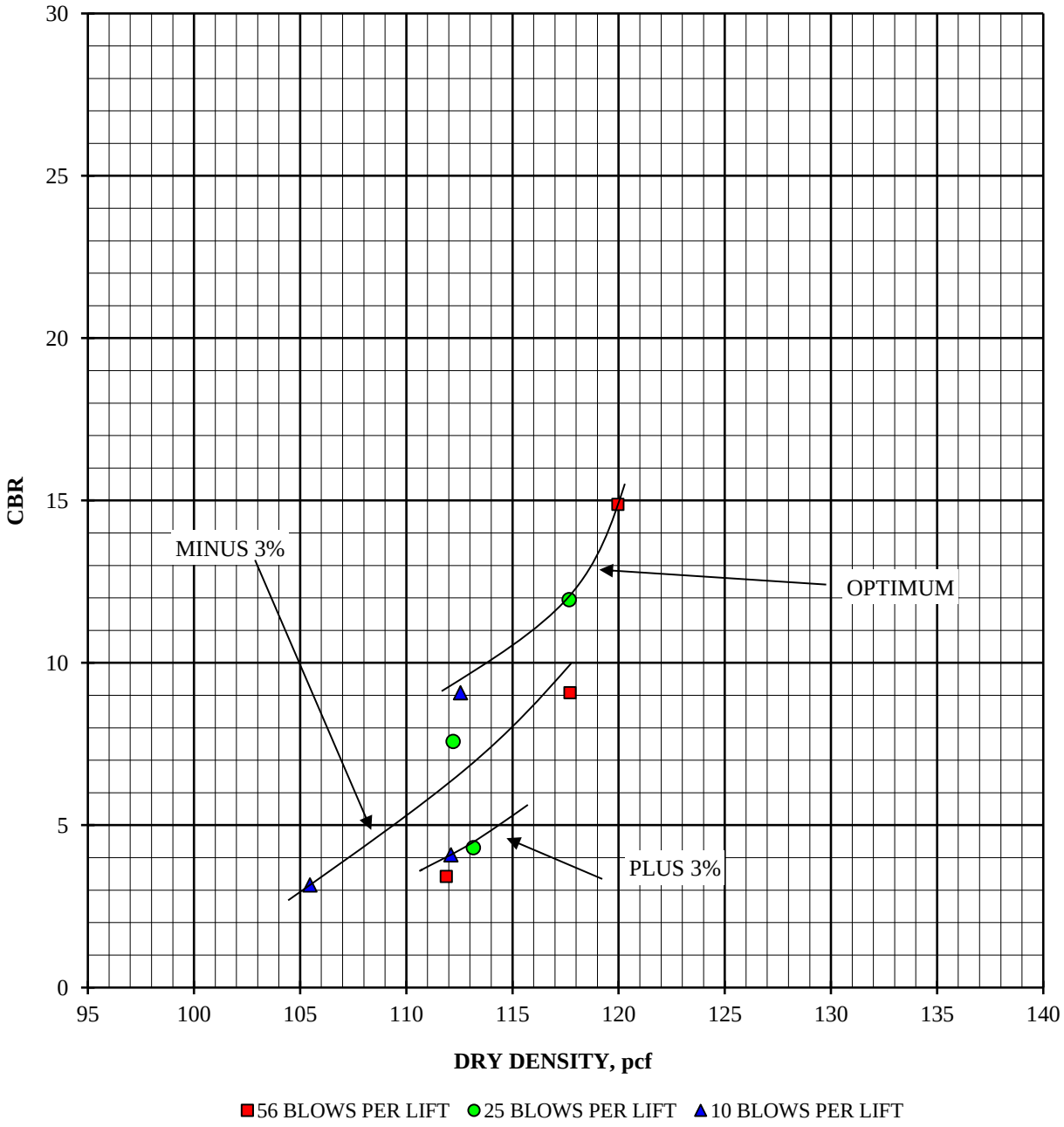
CBR #2; Boring #9 @ 3.0 - 5.0'

January 8, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-07 (At Optimum Moisture Content)

CBR #3 with 3% Lime added; Boring #5 @ 2.0 - 4.0'
Dark Brown Silty Sand (SM)

January 16, 2019

10 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	103.2
Moisture content, %, before soak	12.0
Moisture content, %, after soak, avg.	20.3
Moisture content, %, after soak, top 1"	23.4
Expansion, %, 96 hour soak	0.0
Bearing Ratio, 0.100" penetration	17.4

25 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	113.8
Moisture content, %, before soak	12.0
Moisture content, %, after soak, avg.	14.3
Moisture content, %, after soak, top 1"	19.5
Expansion, %, 96 hour soak	0.0
Bearing Ratio, 0.100" penetration	53.6

56 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	118.3
Moisture content, %, before soak	12.0
Moisture content, %, after soak, avg.	13.2
Moisture content, %, after soak, top 1"	19.0
Expansion, %, 96 hour soak	0.2
Bearing Ratio, 0.100" penetration	78.1

Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

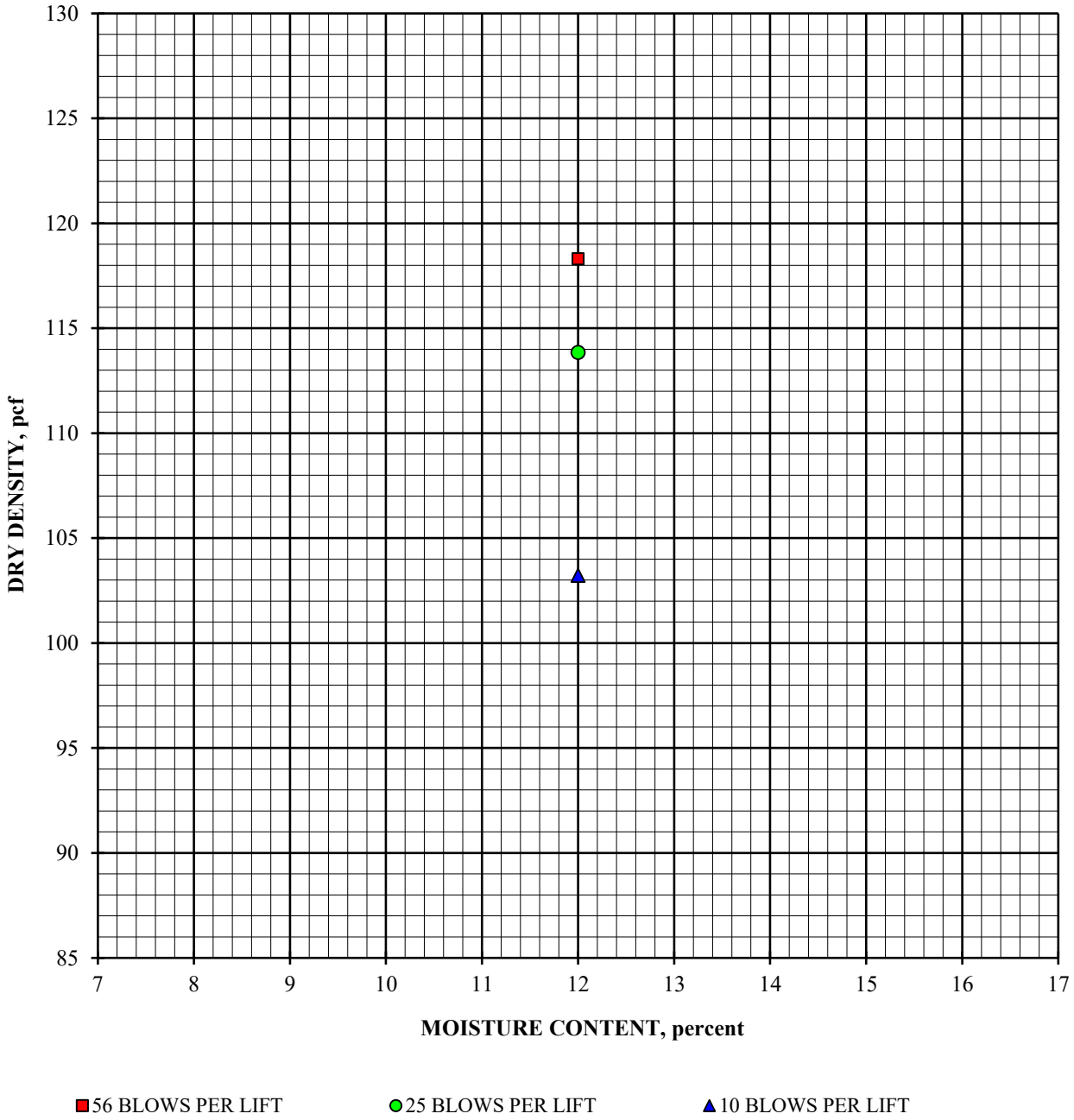
ASTM D 1883-07 (At Optimum Moisture Content)

CBR #3 with 3% Lime added; Boring #5 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Silty Sand (SM)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway and Taxiway
Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

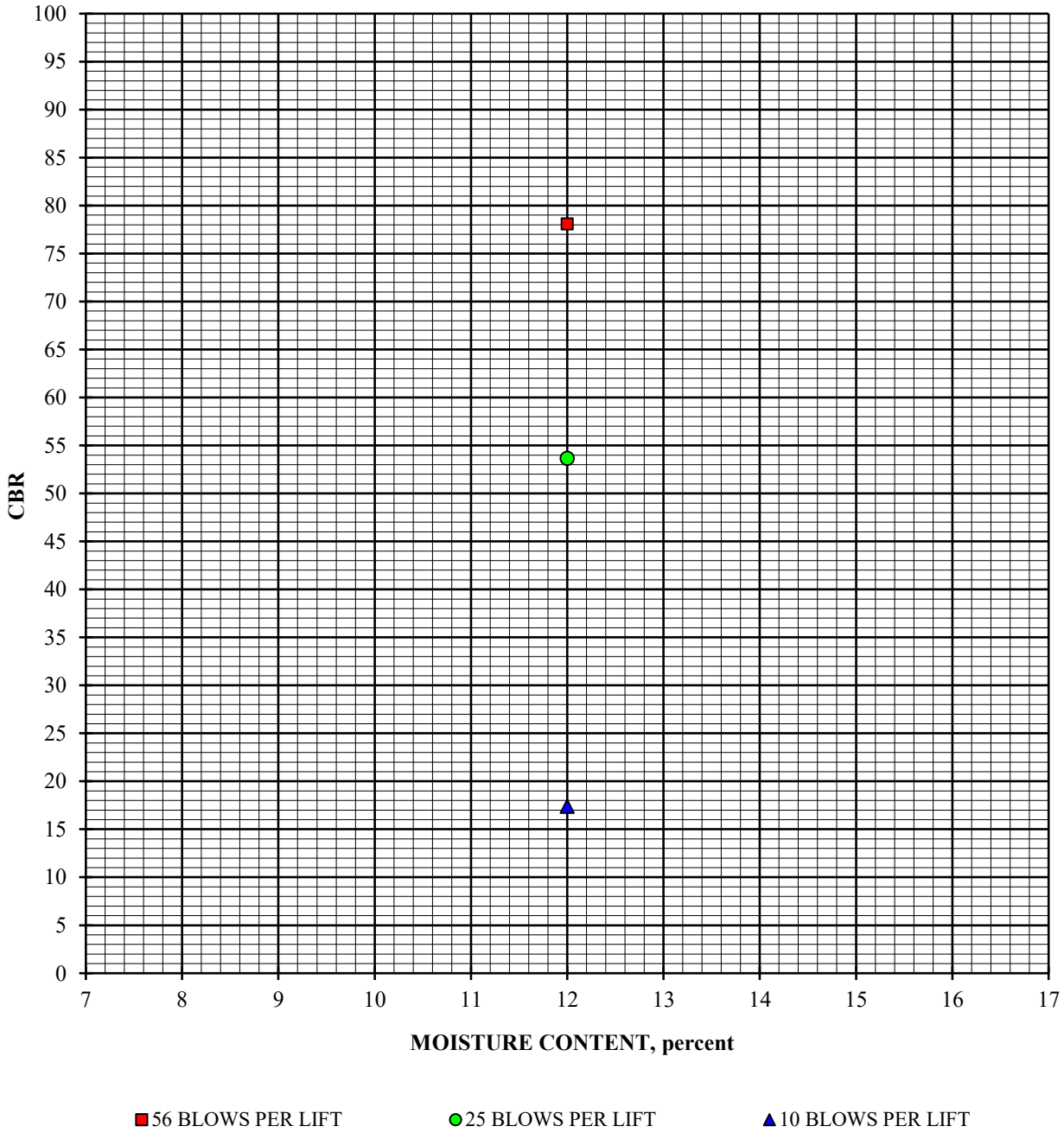
ASTM D 1883-07 (At Optimum Moisture Content)

CBR #3 with 3% Lime added; Boring #5 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Silty Sand (SM)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-07 (At Optimum Moisture Content)

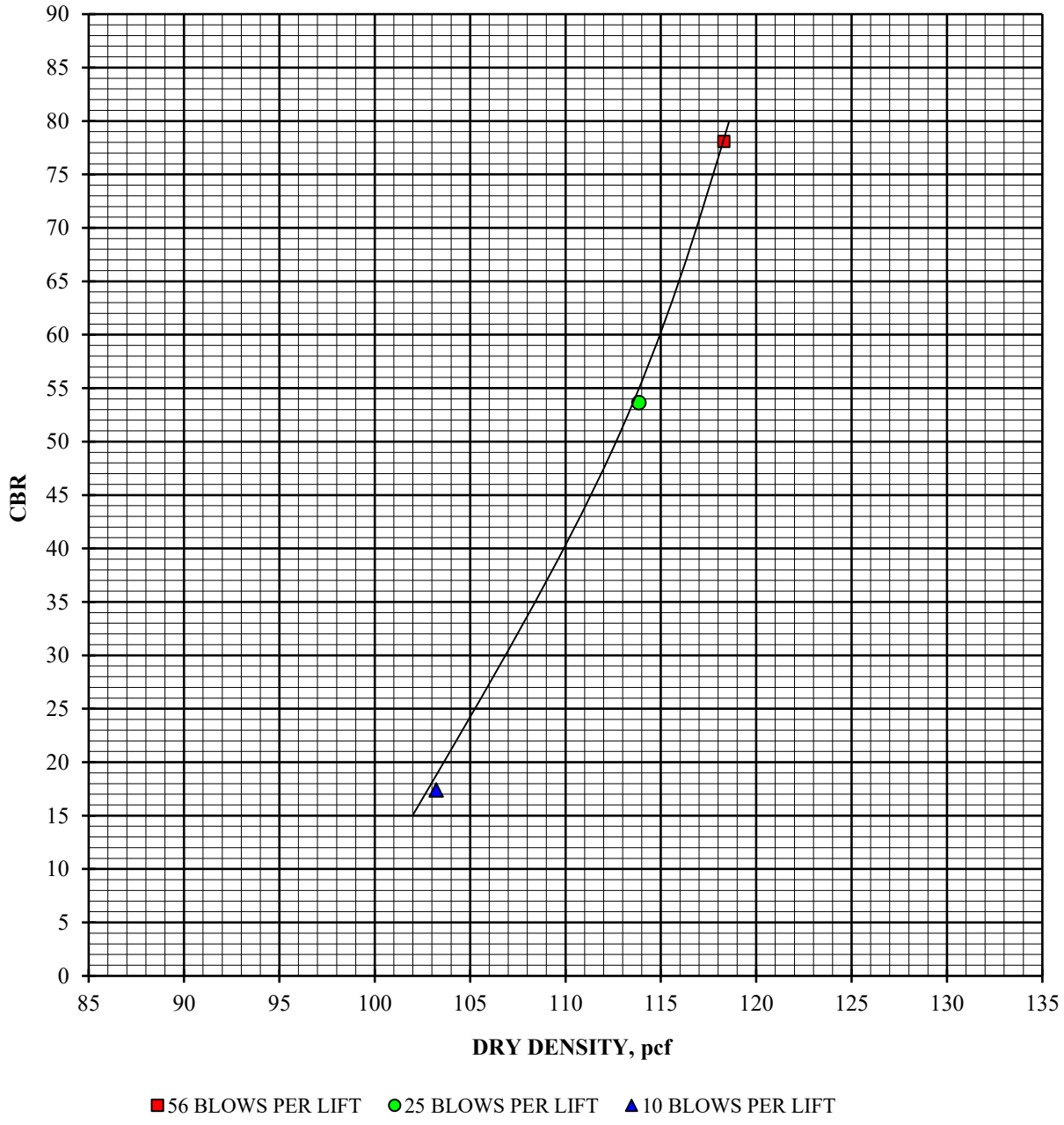
CBR #3 with 3% Lime added; Boring #5 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Silty Sand (SM)

DRY DENSITY vs. CBR

AT Optimum Moisture Content



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-07 (At Optimum Moisture Content)

CBR #3 with 5% Lime added; Boring #5 @ 2.0 - 4.0'
Dark Brown Silty Sand (SM)

January 16, 2019

10 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	99.0
Moisture content, %, before soak	12.2
Moisture content, %, after soak, avg.	24.1
Moisture content, %, after soak, top 1"	23.1
Expansion, %, 96 hour soak	0.0
Bearing Ratio, 0.100" penetration	16.3

25 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	106.8
Moisture content, %, before soak	12.2
Moisture content, %, after soak, avg.	14.3
Moisture content, %, after soak, top 1"	19.9
Expansion, %, 96 hour soak	0.0
Bearing Ratio, 0.100" penetration	52.5

56 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	115.2
Moisture content, %, before soak	12.2
Moisture content, %, after soak, avg.	13.5
Moisture content, %, after soak, top 1"	18.3
Expansion, %, 96 hour soak	0.1
Bearing Ratio, 0.100" penetration	90.9

Oxnard Airport - Runway and Taxiway
Rehabilitation / Reconstruction

302524-001

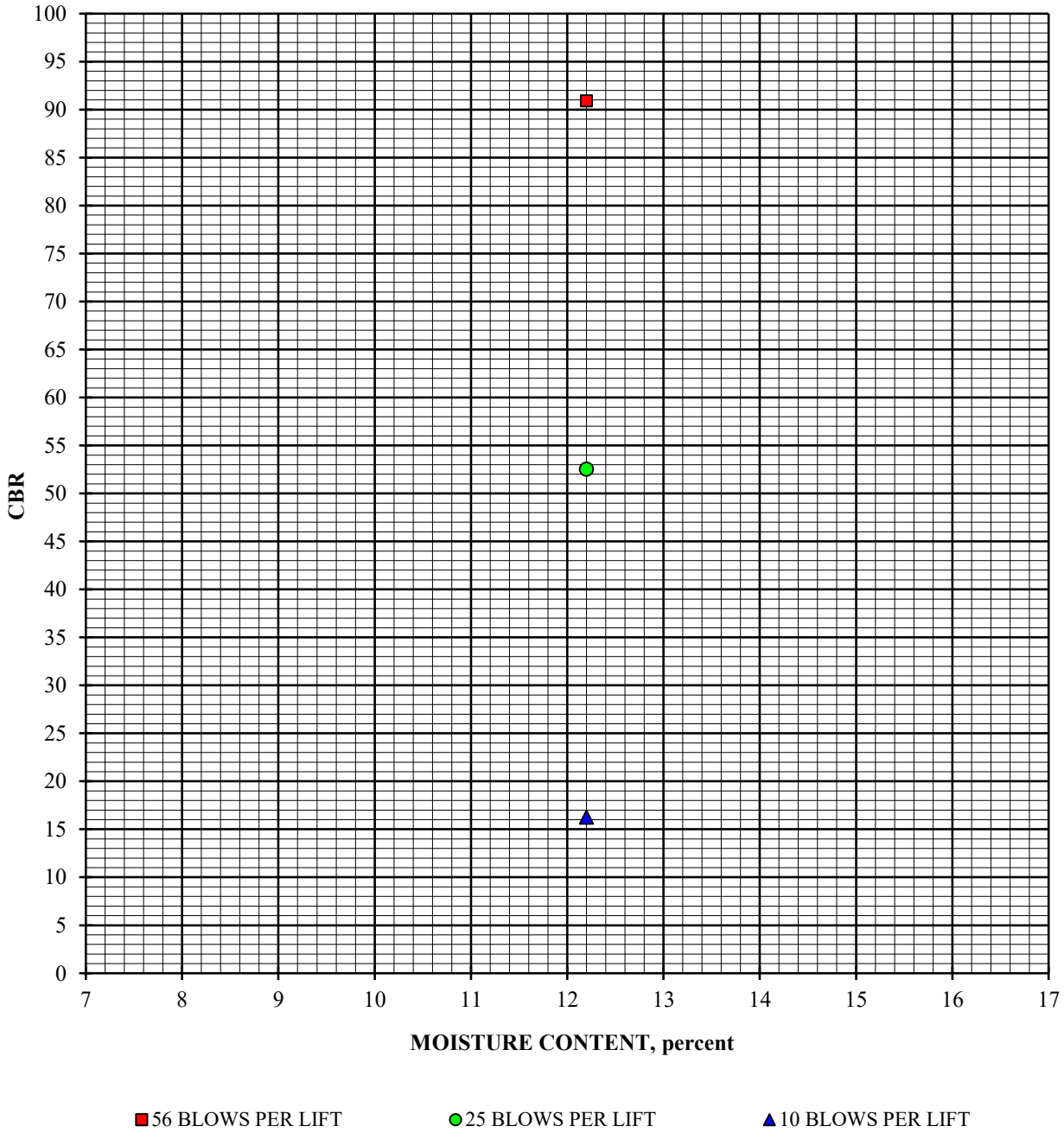
CALIFORNIA BEARING RATIO

ASTM D 1883-07 (At Optimum Moisture Content)

CBR #3 with 5% Lime added; Boring #5 @ 2.0 - 4.0'
Dark Brown Silty Sand (SM)

January 16, 2019

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

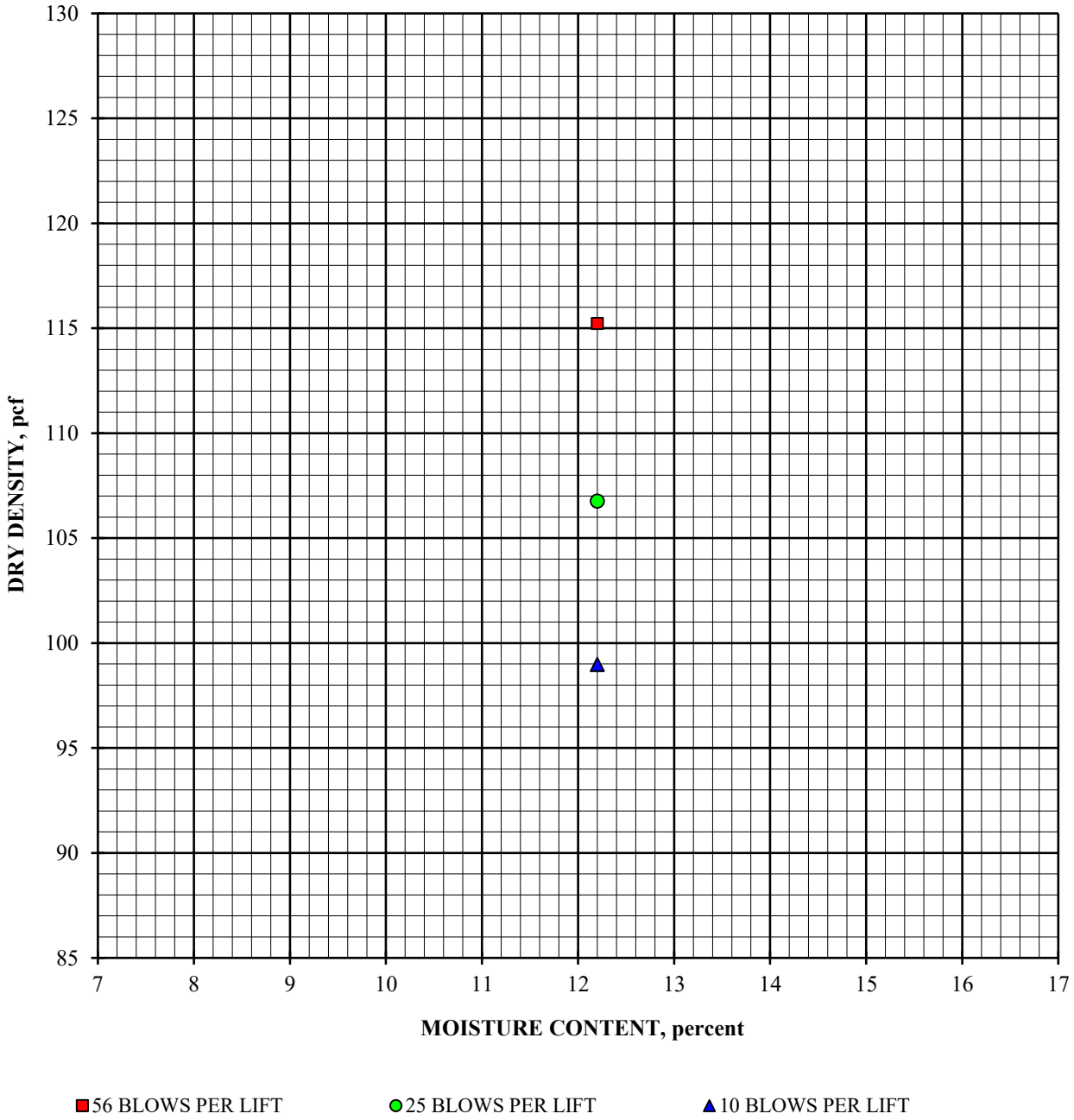
ASTM D 1883-07 (At Optimum Moisture Content)

CBR #3 with 5% Lime added; Boring #5 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Silty Sand (SM)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-07 (At Optimum Moisture Content)

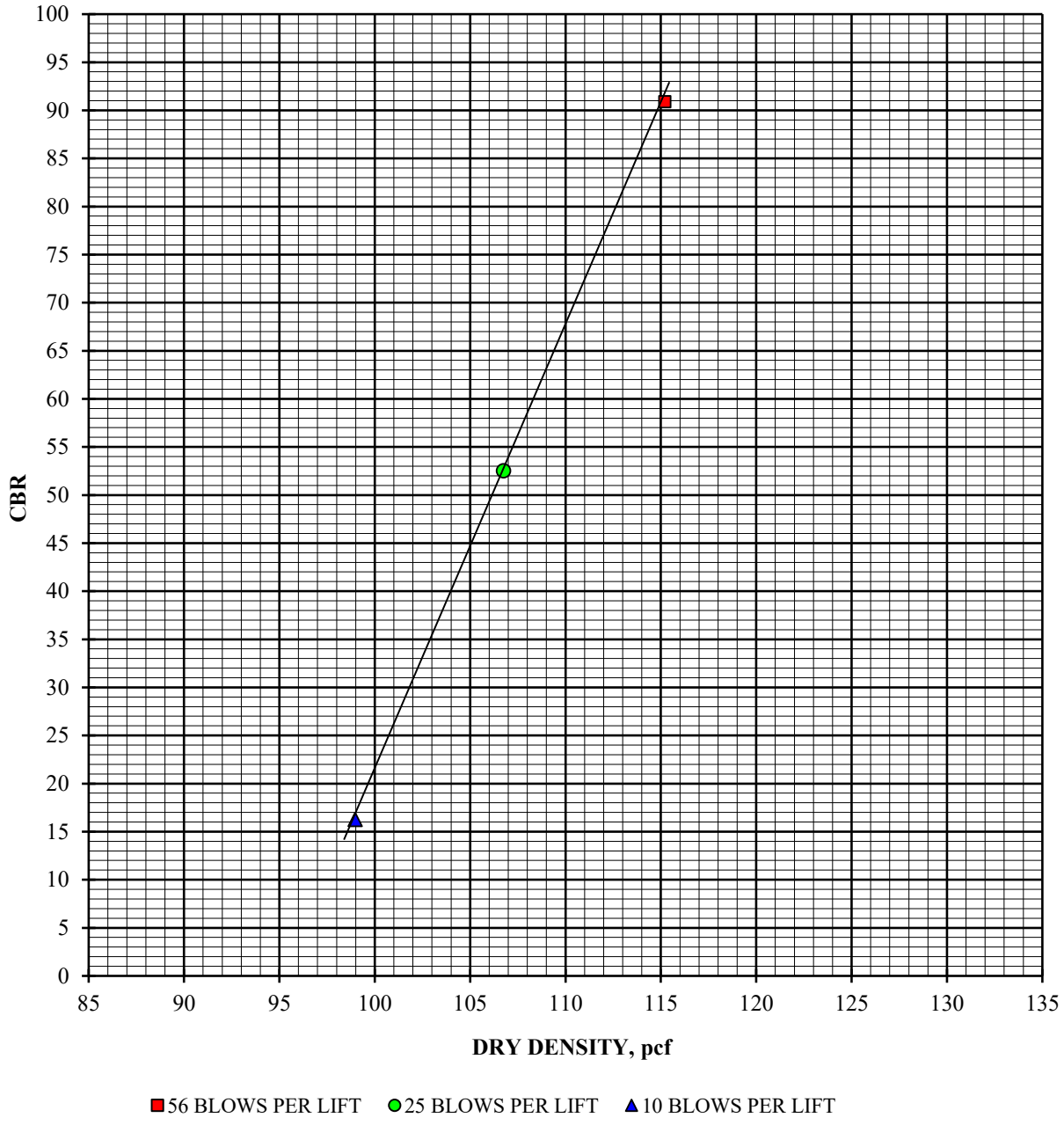
CBR #3 with 5% Lime added; Boring #5 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Silty Sand (SM)

DRY DENSITY vs. CBR

AT Optimum Moisture Content



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-07 (At Optimum Moisture Content)

CBR #3 with 7% Lime added; Boring #5 @ 2.0 - 4.0'
Dark Brown Silty Sand (SM)

January 16, 2019

10 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	97.2
Moisture content, %, before soak	12.3
Moisture content, %, after soak, avg.	25.3
Moisture content, %, after soak, top 1"	24.6
Expansion, %, 96 hour soak	0.1
Bearing Ratio, 0.100" penetration	18.5

25 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	103.2
Moisture content, %, before soak	12.3
Moisture content, %, after soak, avg.	16.3
Moisture content, %, after soak, top 1"	22.4
Expansion, %, 96 hour soak	0.2
Bearing Ratio, 0.100" penetration	35.3

56 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	111.9
Moisture content, %, before soak	12.3
Moisture content, %, after soak, avg.	13.6
Moisture content, %, after soak, top 1"	19.6
Expansion, %, 96 hour soak	0.5
Bearing Ratio, 0.100" penetration	77.6

Oxnard Airport - Runway and Taxiway
Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

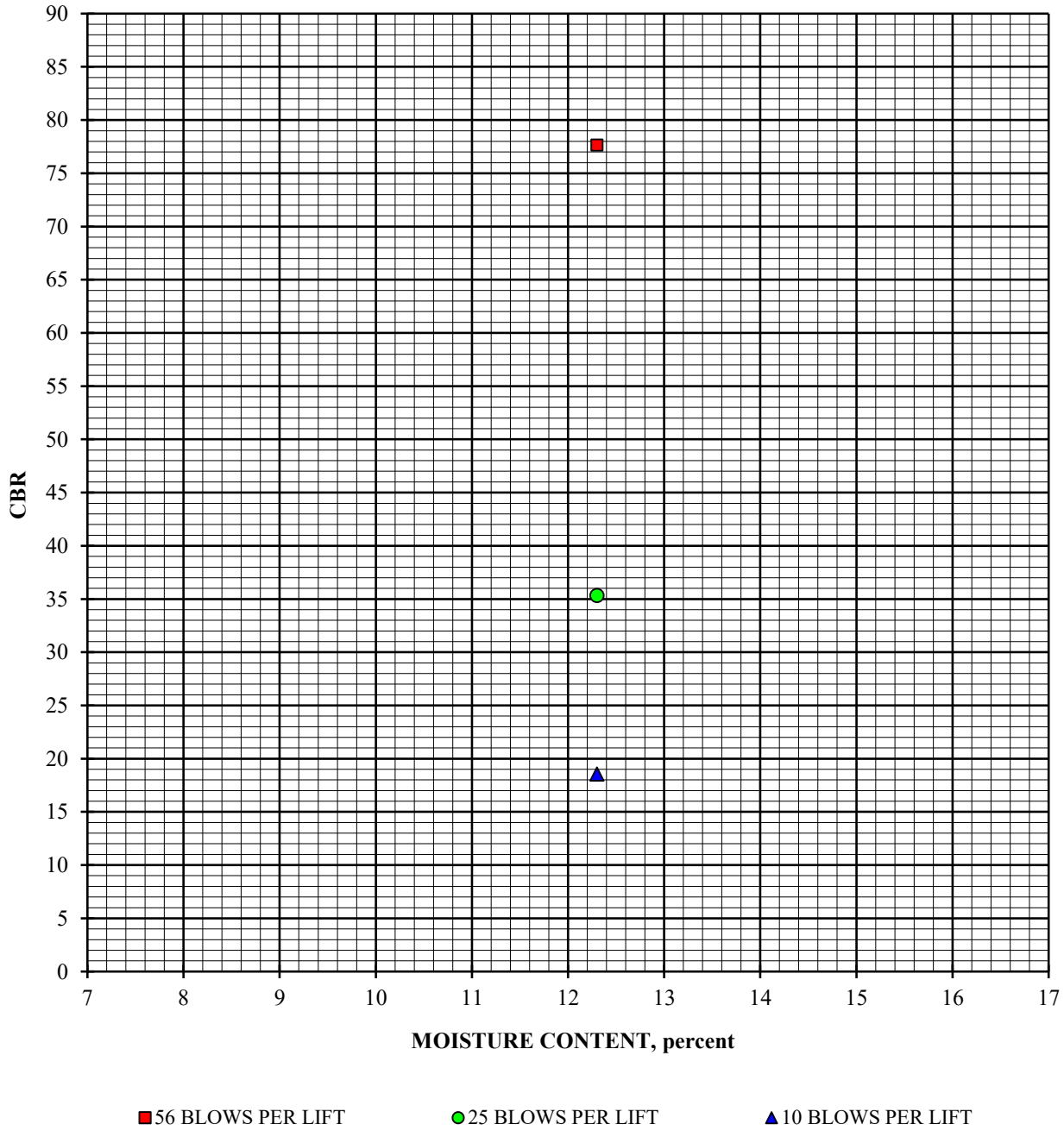
ASTM D 1883-07 (At Optimum Moisture Content)

CBR #3 with 7% Lime added; Boring #5 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Silty Sand (SM)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

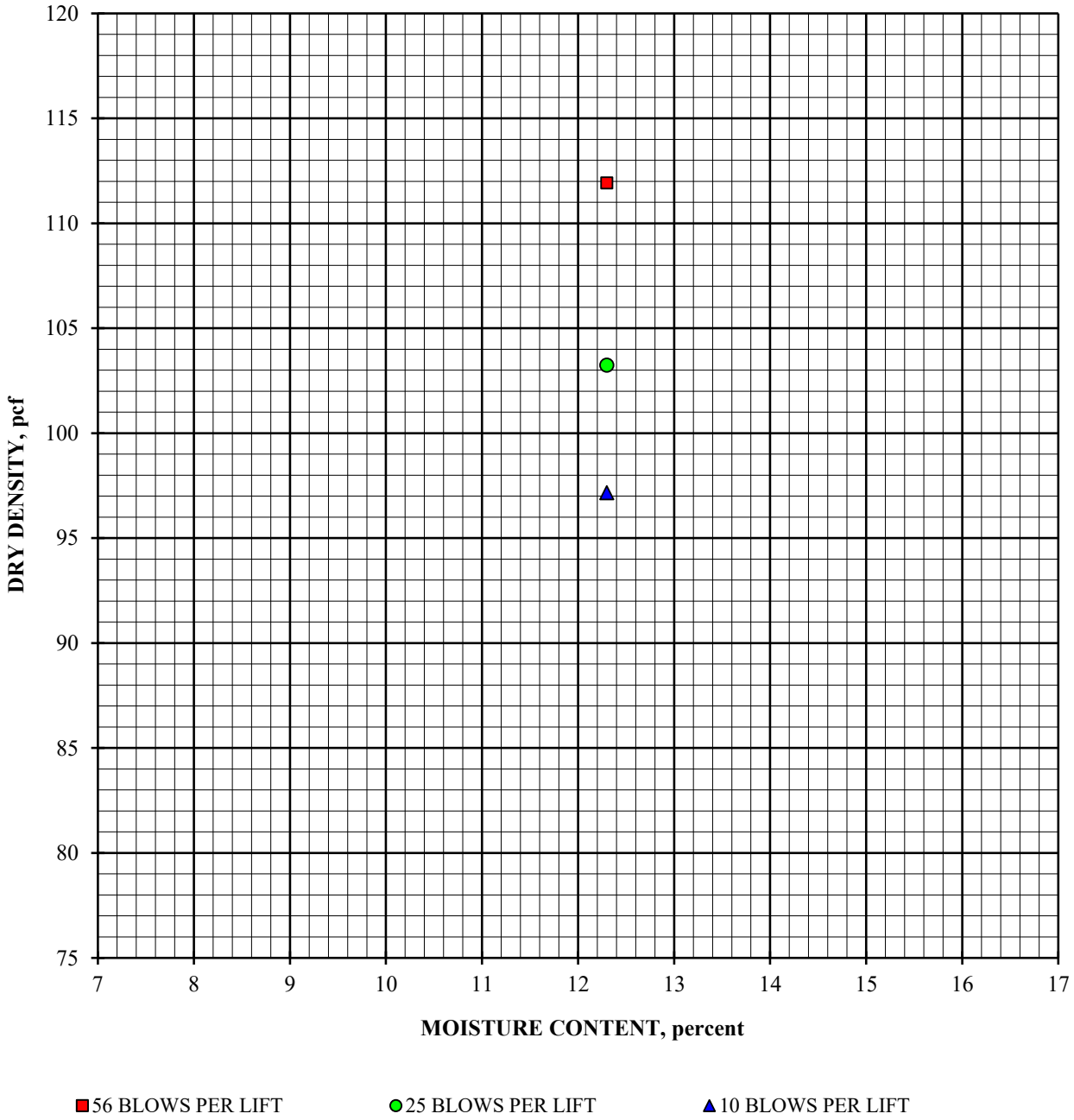
ASTM D 1883-07 (At Optimum Moisture Content)

CBR #3 with 7% Lime added; Boring #5 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Silty Sand (SM)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-07 (At Optimum Moisture Content)

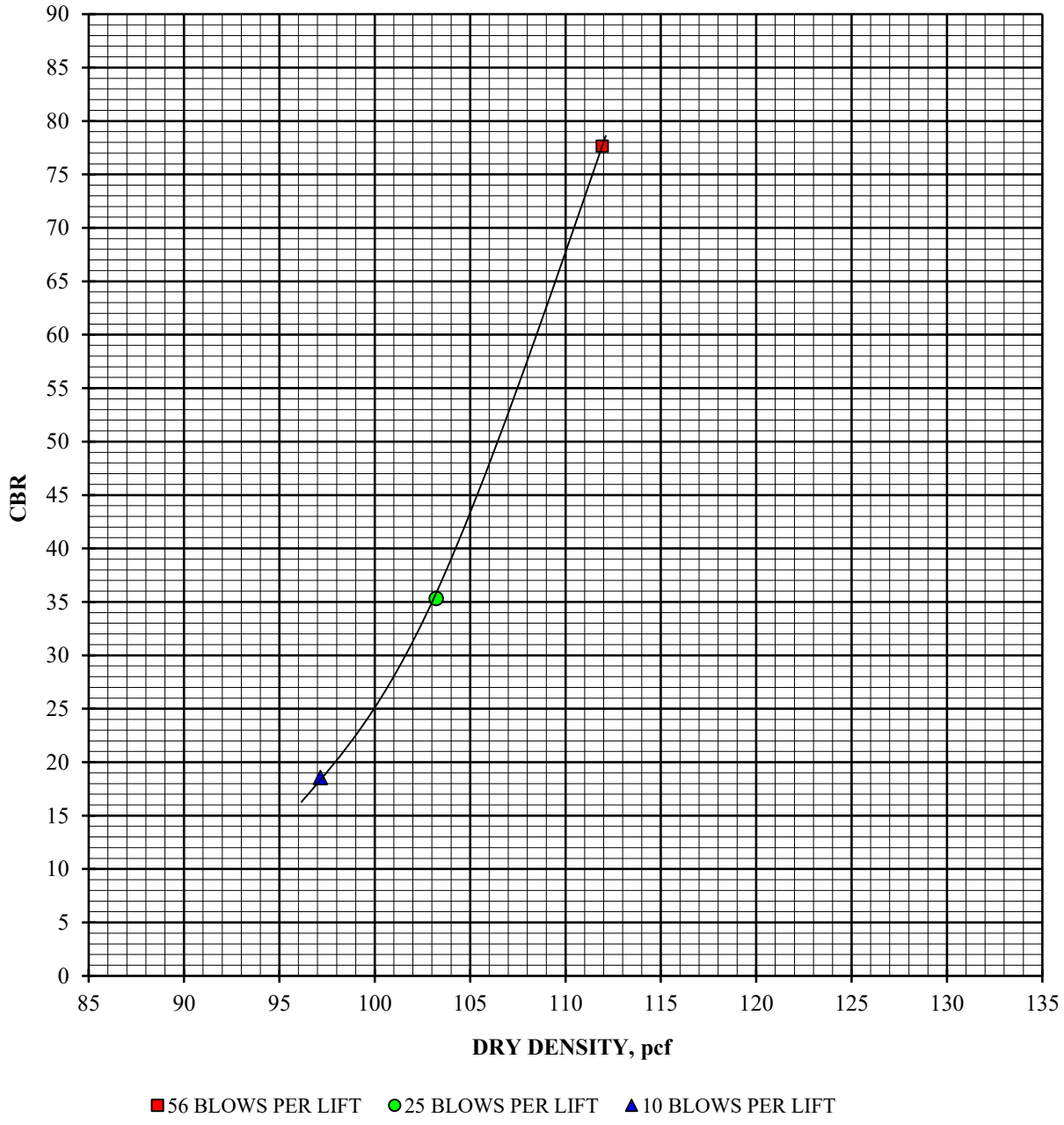
CBR #3 with 7% Lime added; Boring #5 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Silty Sand (SM)

DRY DENSITY vs. CBR

AT Optimum Moisture Content



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #4; Boring #3 @ 0.5 - 1.0'
Brown Clayey Sand with Gravel (SC)

January 8, 2019

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	121.6	124.2	124.9
Moisture content, %, before soak	3.9	6.9	9.9
Moisture content, %, after soak, avg.	10.6	13.7	12.2
Moisture content, %, after soak, top 1"	11.8	9.4	10.0
Expansion, %, 96 hour soak	0.9	0.1	0.1
Bearing Ratio, 0.100" penetration	10.6	17.4	8.9

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	125.1	129.2	125.8
Moisture content, %, before soak	3.9	6.9	9.9
Moisture content, %, after soak, avg.	8.1	8.7	10.4
Moisture content, %, after soak, top 1"	9.1	7.5	9.9
Expansion, %, 96 hour soak	0.7	0.2	0.2
Bearing Ratio, 0.100" penetration	27.9	56.6	6.2

56 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	131.6	130.9	126.5
Moisture content, %, before soak	3.9	6.9	9.9
Moisture content, %, after soak, avg.	7.1	8.4	11.6
Moisture content, %, after soak, top 1"	8.1	7.3	10.1
Expansion, %, 96 hour soak	0.5	0.4	0.1
Bearing Ratio, 0.100" penetration	58.9	80.7	11.0

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

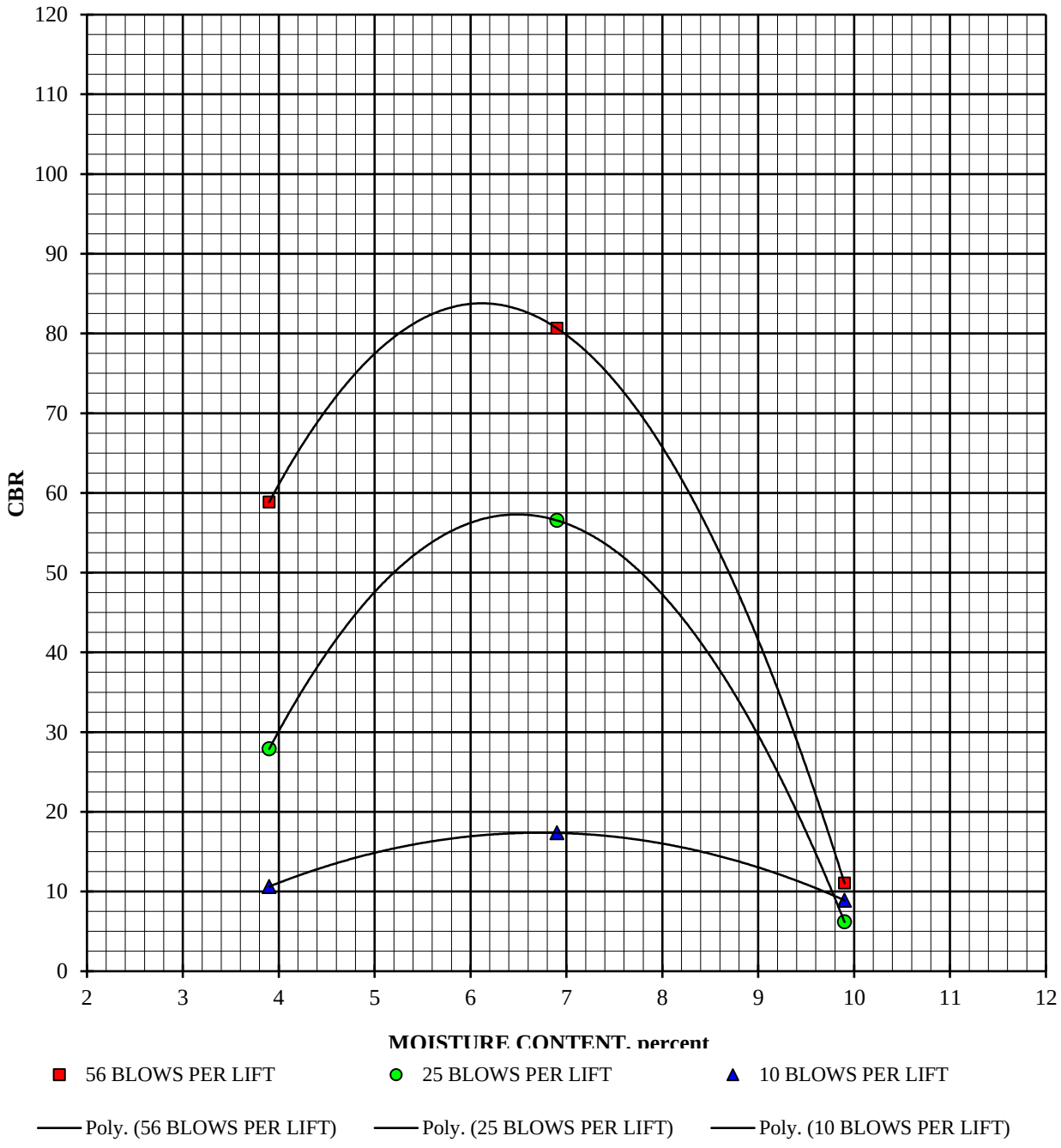
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #4; Boring #3 @ 0.5 - 1.0'

January 8, 2019

Brown Clayey Sand with Gravel (SC)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

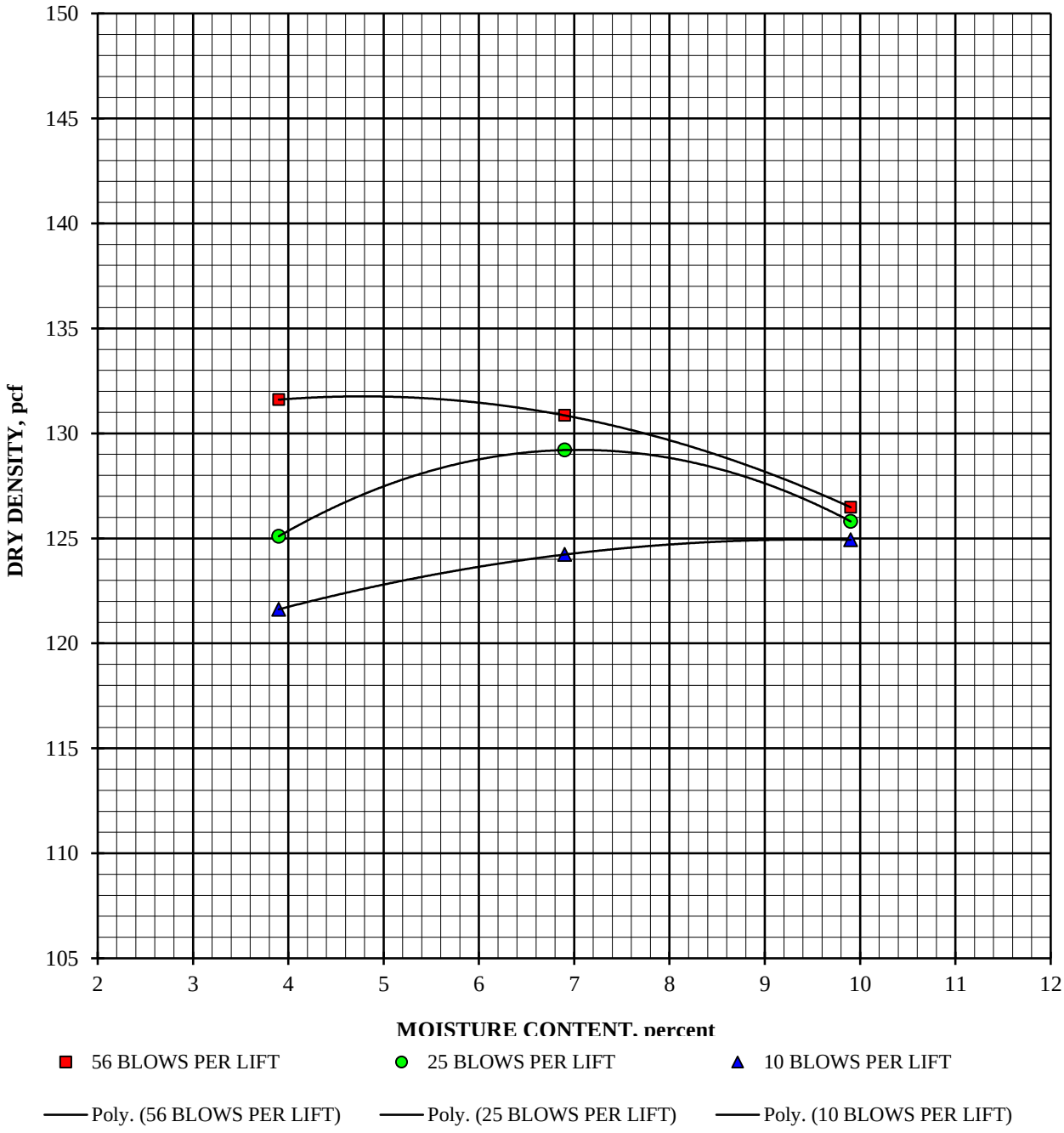
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #4; Boring #3 @ 0.5 - 1.0'

January 8, 2019

Brown Clayey Sand with Gravel (SC)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

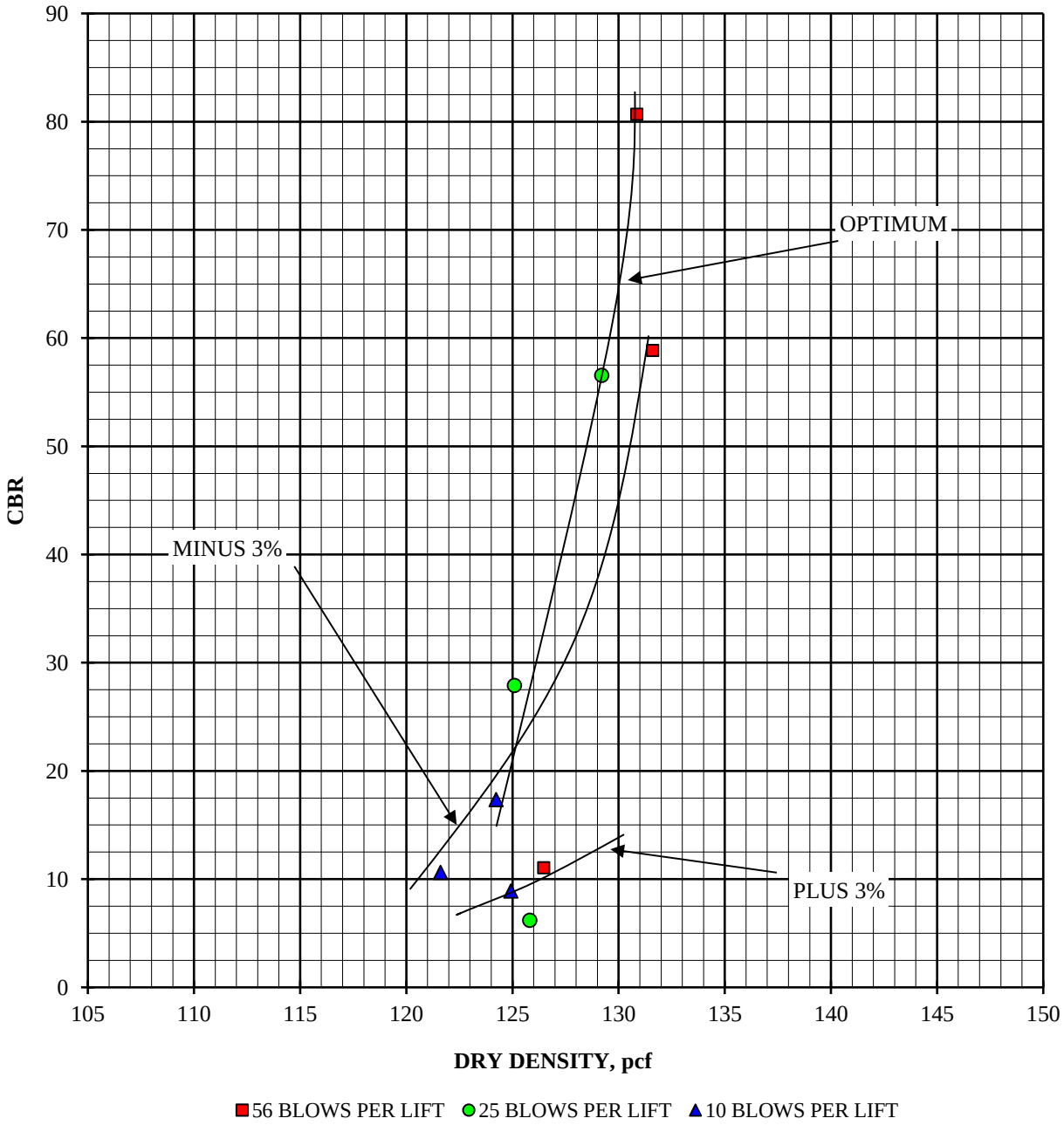
CBR #4; Boring #3 @ 0.5 - 1.0'

January 8, 2019

Brown Clayey Sand with Gravel (SC)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #5; Boring #36 @ 2.5 - 5.0'
Dark Brown Sandy Lean Clay (CL)

January 8, 2019

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	105.0	107.6	105.1
Moisture content, %, before soak	7.7	10.7	13.7
Moisture content, %, after soak, avg.	21.4	14.8	26.8
Moisture content, %, after soak, top 1"	19.4	21.5	18.9
Expansion, %, 96 hour soak	1.9	0.3	0.1
Bearing Ratio, 0.100" penetration	2.3	2.6	2.2

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	111.8	115.1	115.9
Moisture content, %, before soak	7.7	10.7	13.7
Moisture content, %, after soak, avg.	18.1	16.4	16.7
Moisture content, %, after soak, top 1"	17.8	21.8	17.6
Expansion, %, 96 hour soak	2.0	0.6	0.1
Bearing Ratio, 0.100" penetration	3.8	14.4	7.4

56 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	121.2	121.4	118.4
Moisture content, %, before soak	7.7	10.7	13.7
Moisture content, %, after soak, avg.	13.5	11.6	14.1
Moisture content, %, after soak, top 1"	15.3	13.7	14.4
Expansion, %, 96 hour soak	2.7	0.2	0.1
Bearing Ratio, 0.100" penetration	10.6	24.2	6.2

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

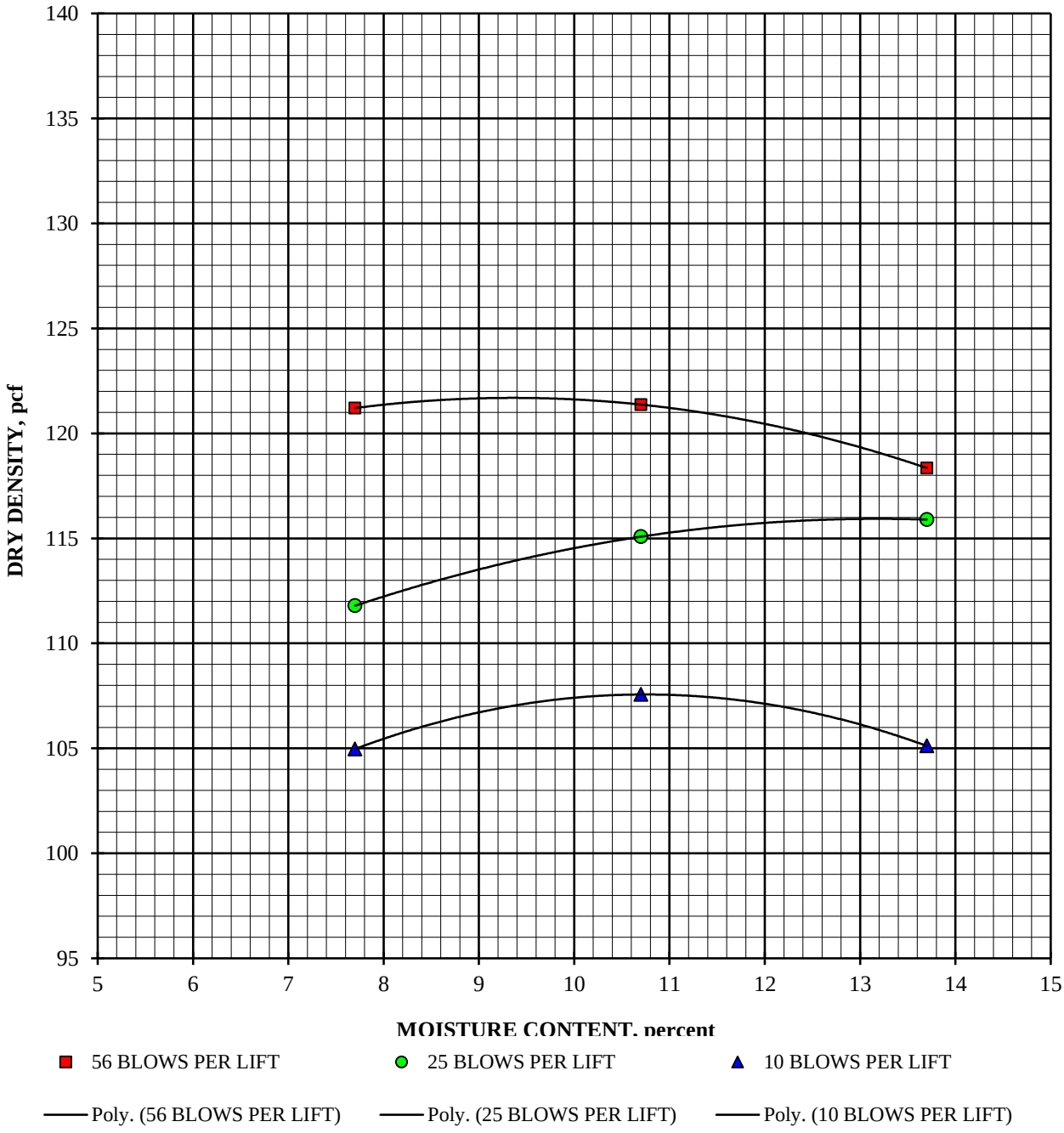
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #5; Boring #36 @ 2.5 - 5.0'

January 8, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

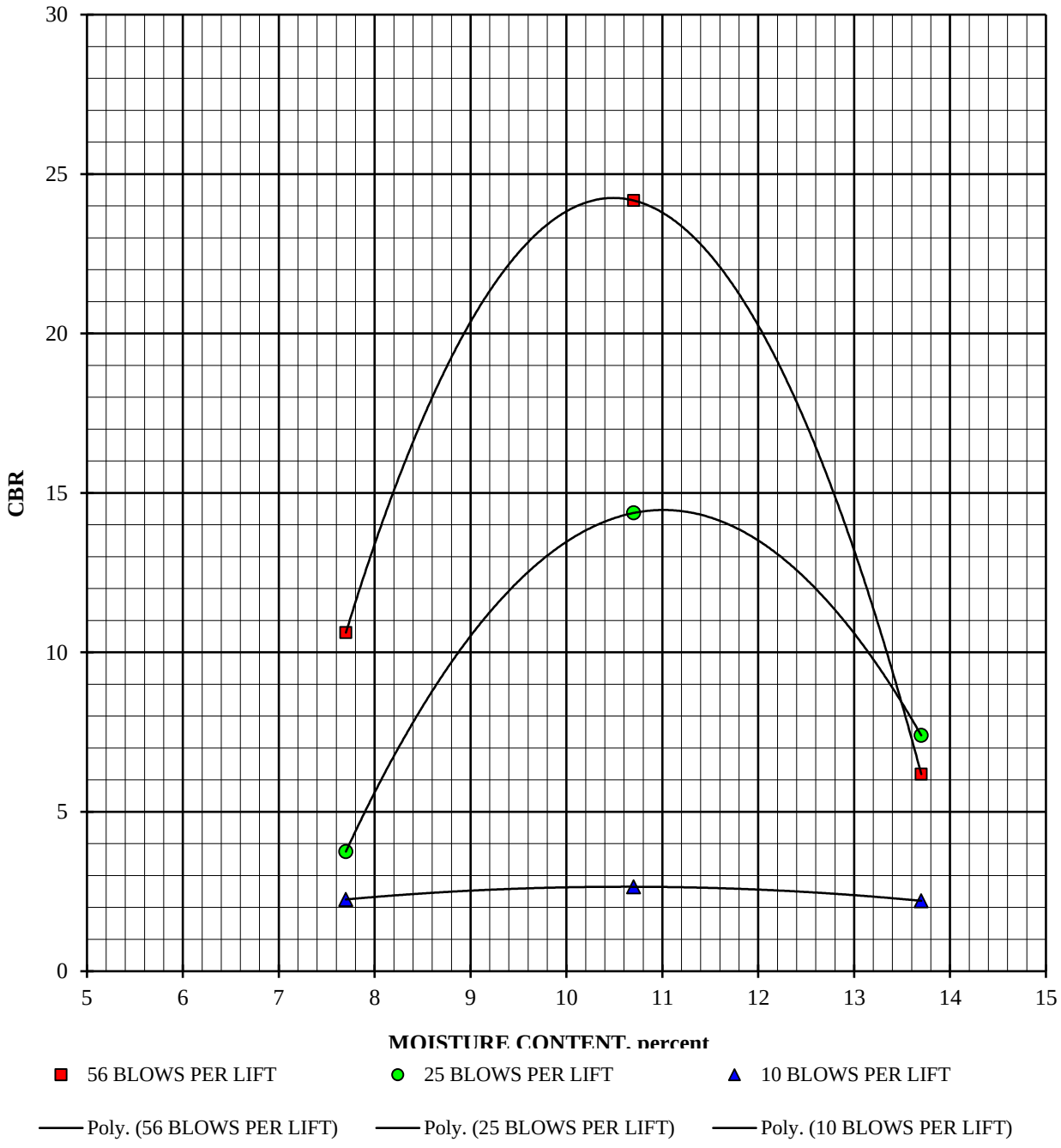
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #5; Boring #36 @ 2.5 - 5.0'

January 8, 2019

Dark Brown Sandy Lean Clay (CL)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

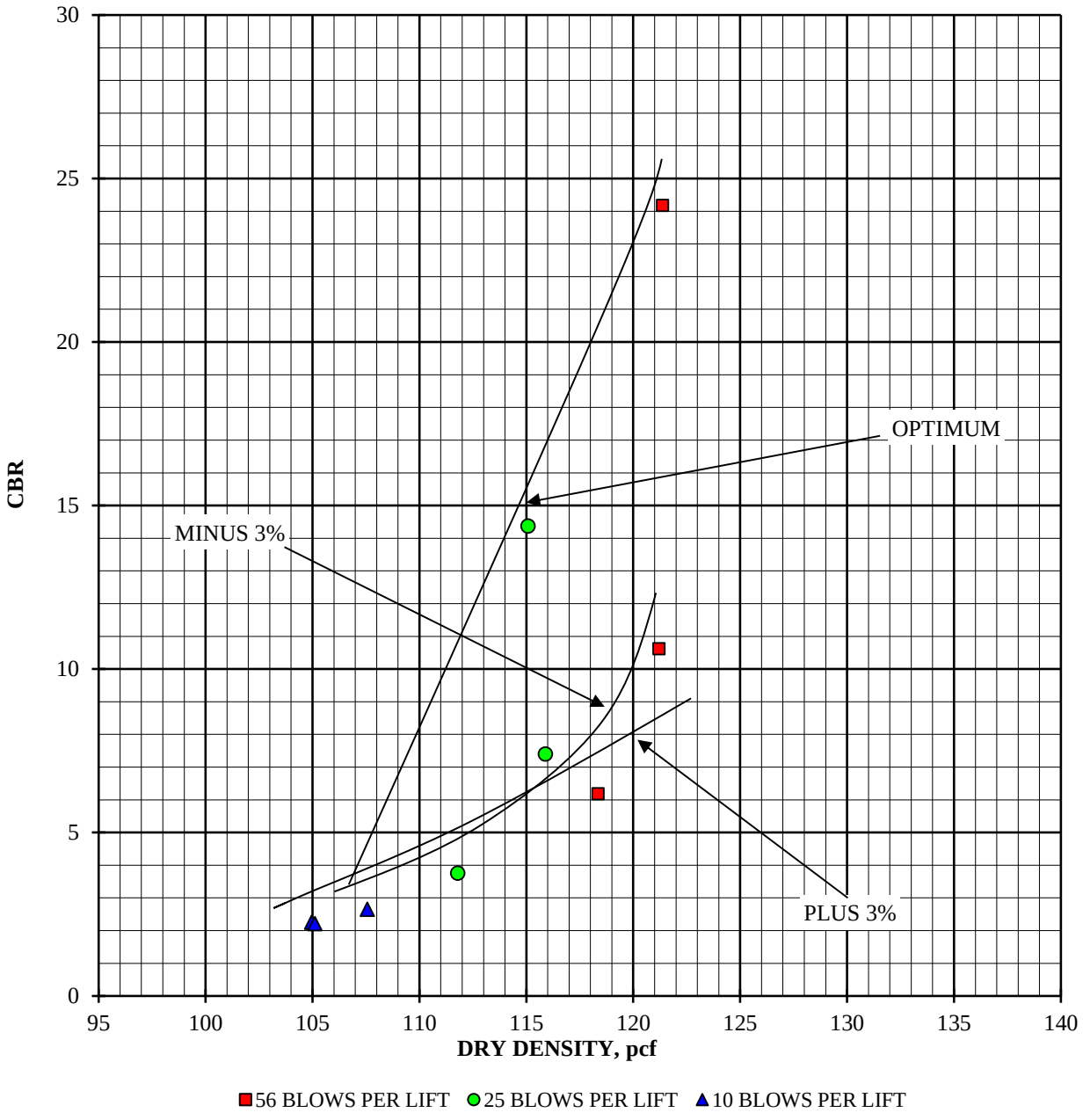
CBR #5; Boring #36 @ 2.5 - 5.0'

January 8, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-07 (At Optimum Moisture Content)

CBR #6 with 3% Lime added; Boring #27 @ 2.0 - 4.0'
Dark Brown Sandy Lean Clay (CL)

January 16, 2019

10 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	106.0
Moisture content, %, before soak	14.1
Moisture content, %, after soak, avg.	19.0
Moisture content, %, after soak, top 1"	25.6
Expansion, %, 96 hour soak	0.1
Bearing Ratio, 0.100" penetration	27.4

25 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	114.4
Moisture content, %, before soak	14.1
Moisture content, %, after soak, avg.	14.7
Moisture content, %, after soak, top 1"	19.2
Expansion, %, 96 hour soak	0.1
Bearing Ratio, 0.100" penetration	48.4

56 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	116.4
Moisture content, %, before soak	14.1
Moisture content, %, after soak, avg.	15.0
Moisture content, %, after soak, top 1"	18.3
Expansion, %, 96 hour soak	0.1
Bearing Ratio, 0.100" penetration	53.4

Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

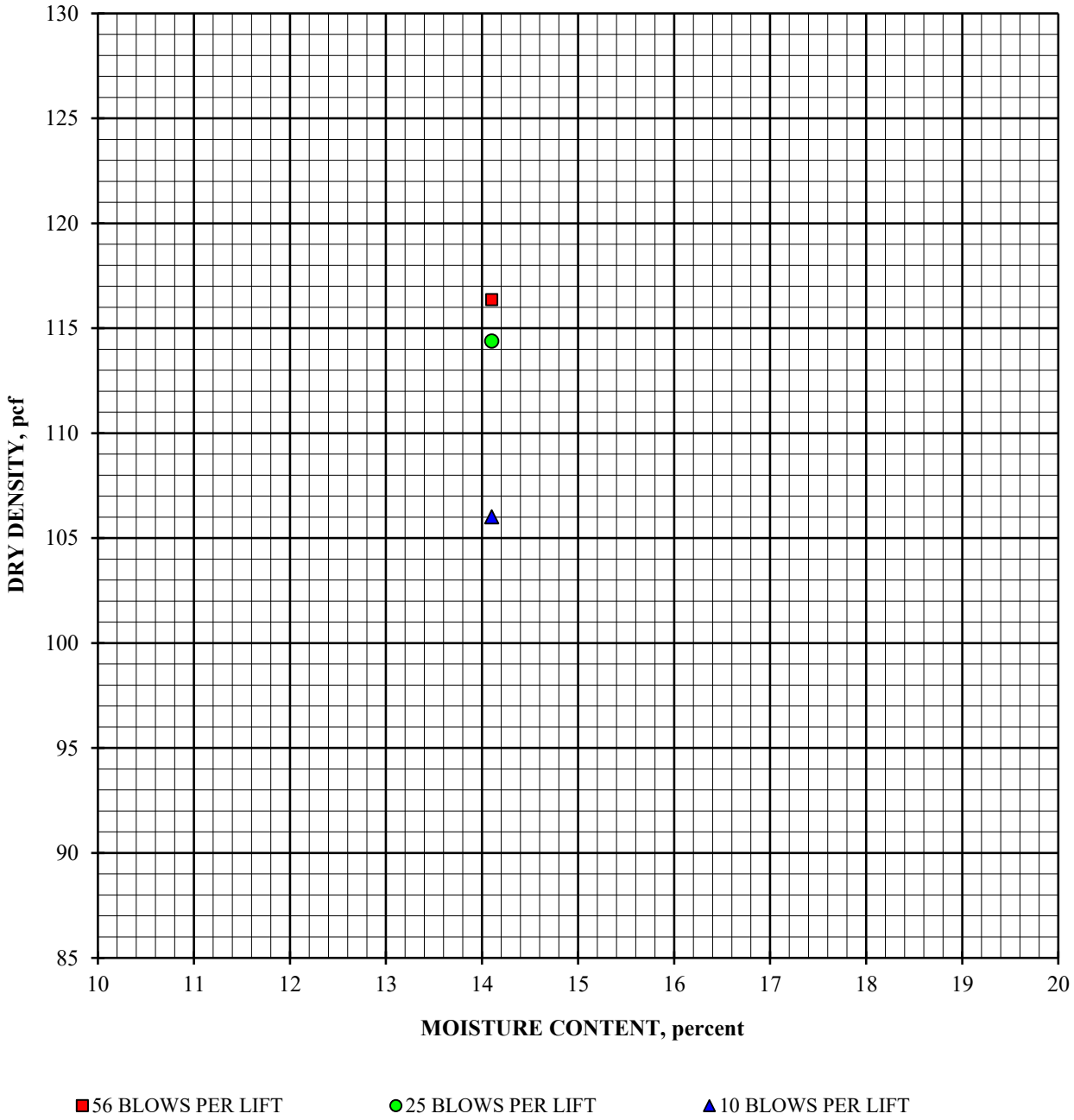
ASTM D 1883-07 (At Optimum Moisture Content)

CBR #6 with 3% Lime added; Boring #27 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway and Taxiway
Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

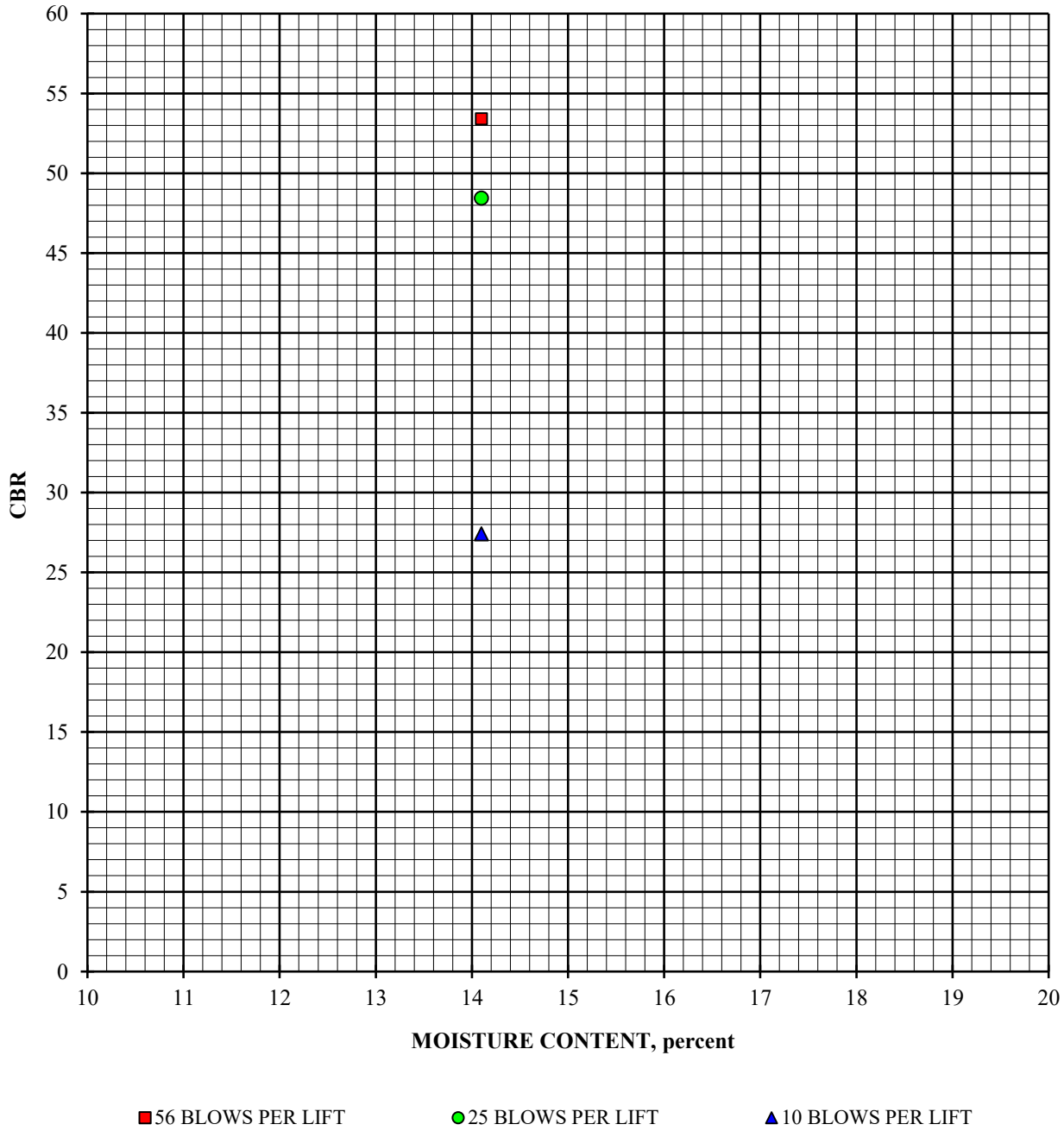
ASTM D 1883-07 (At Optimum Moisture Content)

CBR #6 with 3% Lime added; Boring #27 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Sandy Lean Clay (CL)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-07 (At Optimum Moisture Content)

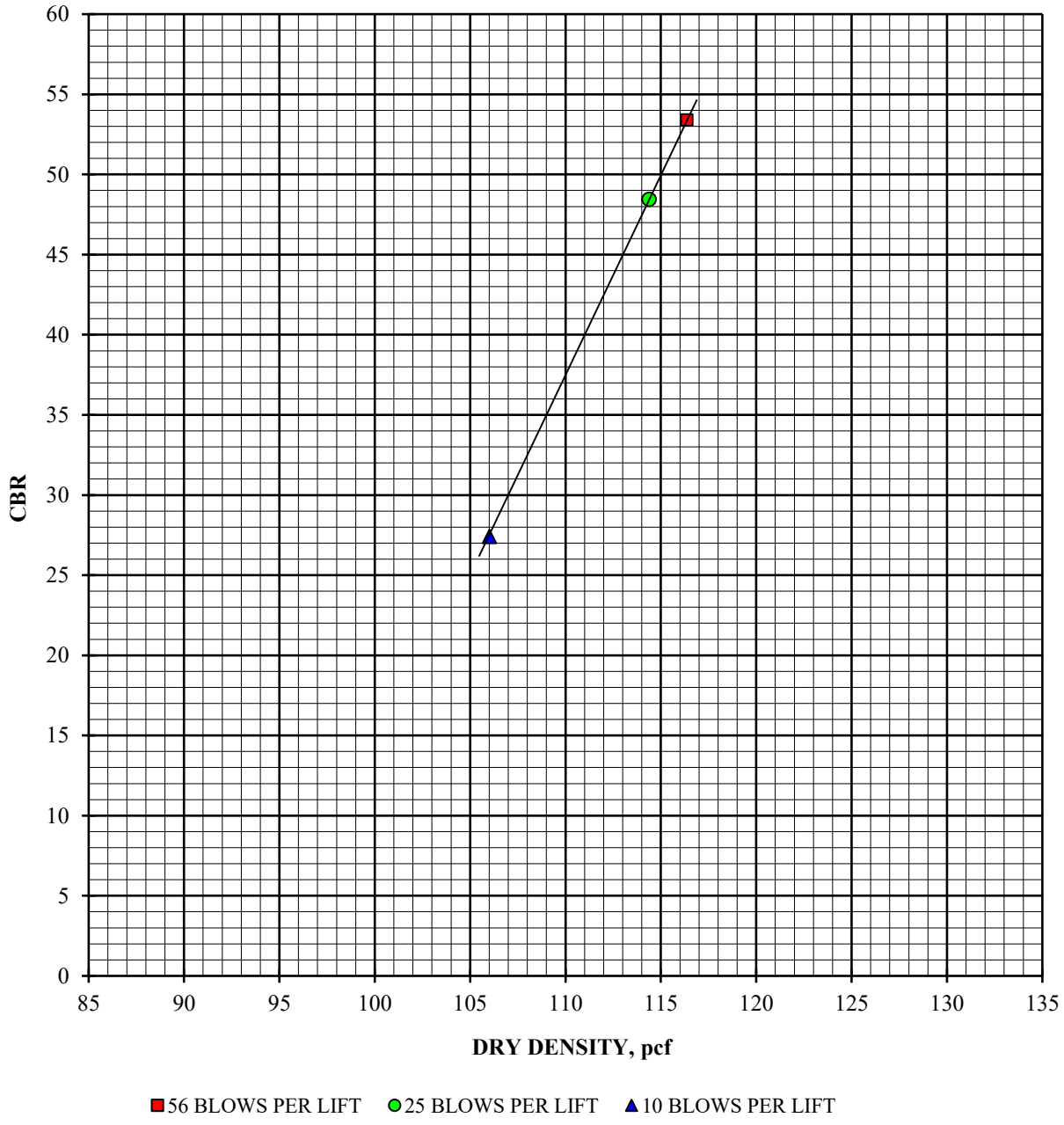
CBR #6 with 3% Lime added; Boring #27 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. CBR

AT Optimum Moisture Content



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-07 (At Optimum Moisture Content)

CBR #6 with 5% Lime added; Boring #27 @ 2.0 - 4.0'
Dark Brown Sandy Lean Clay (CL)

January 16, 2019

10 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	98.9
Moisture content, %, before soak	15.2
Moisture content, %, after soak, avg.	22.6
Moisture content, %, after soak, top 1"	24.8
Expansion, %, 96 hour soak	0.1
Bearing Ratio, 0.100" penetration	22.2

25 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	108.3
Moisture content, %, before soak	15.2
Moisture content, %, after soak, avg.	19.2
Moisture content, %, after soak, top 1"	21.4
Expansion, %, 96 hour soak	0.0
Bearing Ratio, 0.100" penetration	53.4

56 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	114.1
Moisture content, %, before soak	15.2
Moisture content, %, after soak, avg.	17.7
Moisture content, %, after soak, top 1"	19.5
Expansion, %, 96 hour soak	0.1
Bearing Ratio, 0.100" penetration	72.9

Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

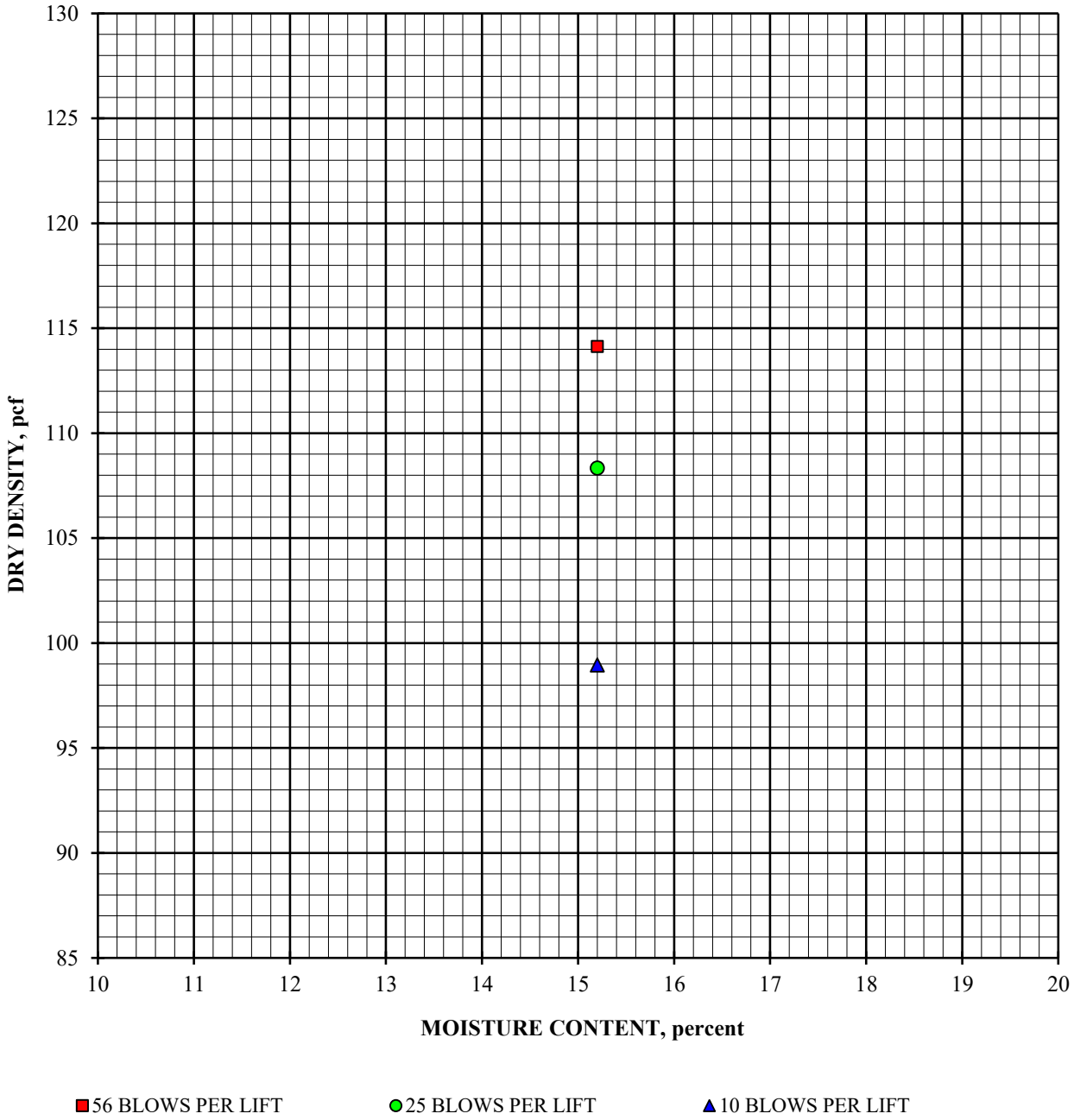
ASTM D 1883-07 (At Optimum Moisture Content)

CBR #6 with 5% Lime added; Boring #27 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway and Taxiway
Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

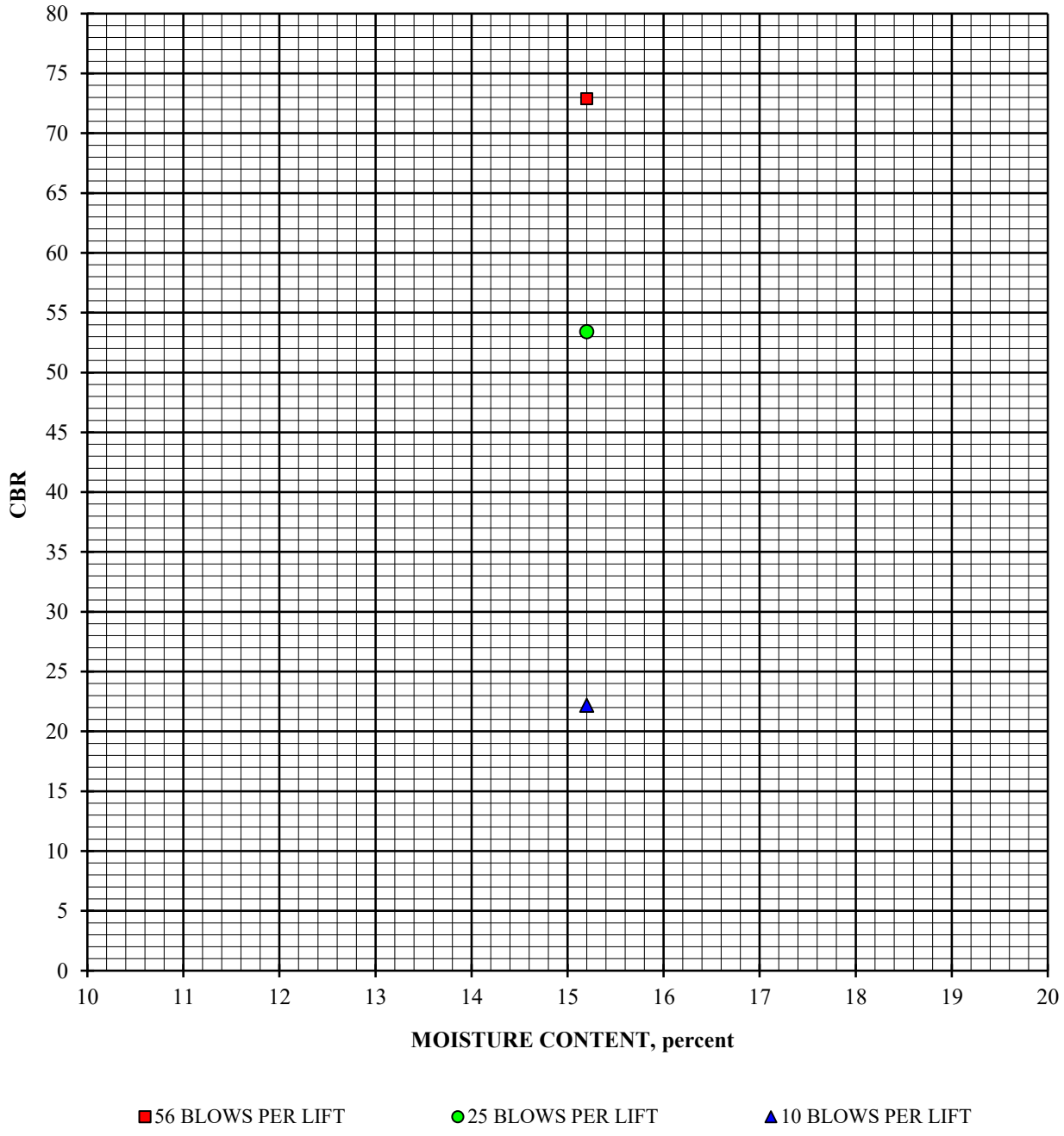
ASTM D 1883-07 (At Optimum Moisture Content)

CBR #6 with 5% Lime added; Boring #27 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Sandy Lean Clay (CL)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-07 (At Optimum Moisture Content)

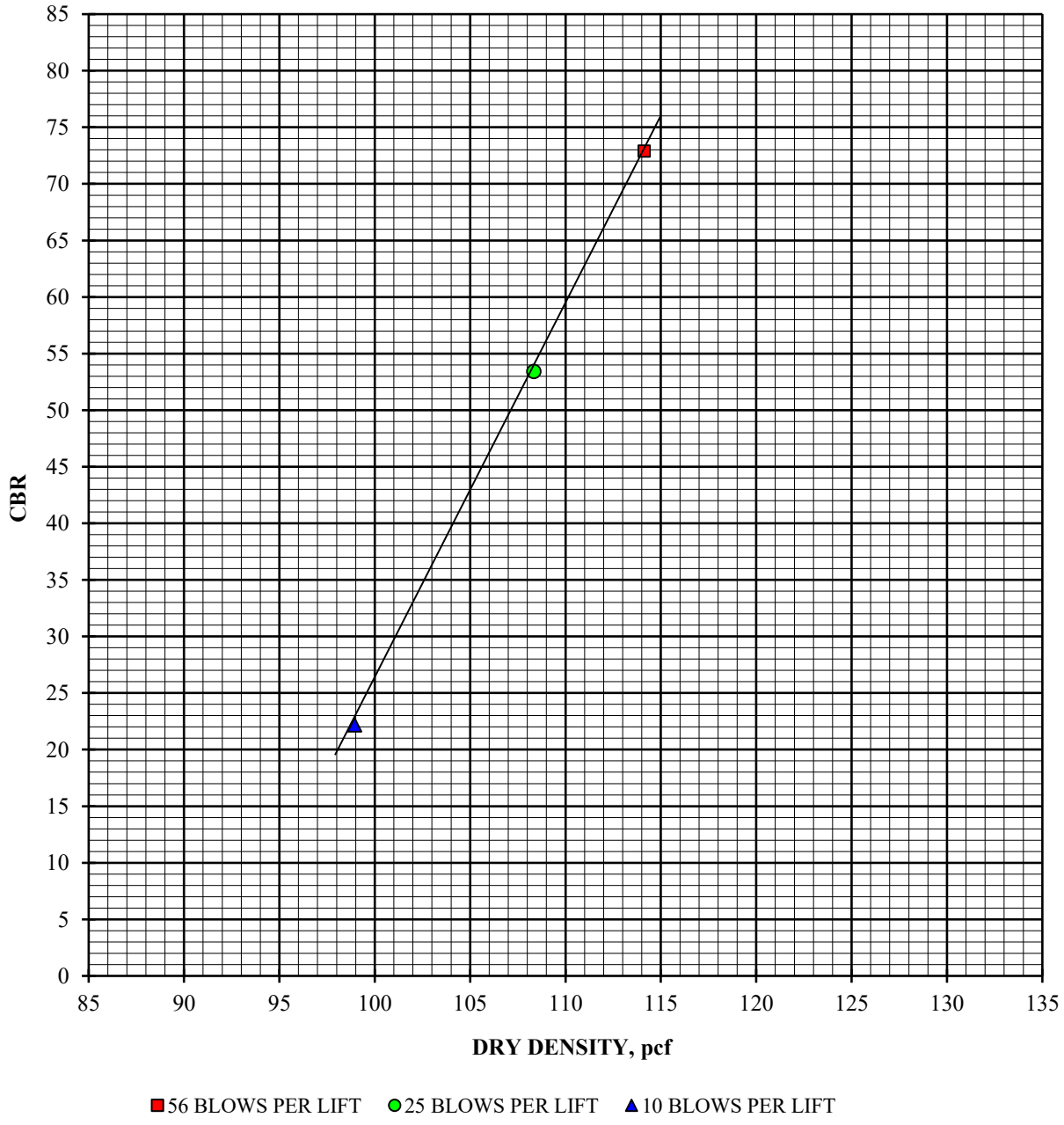
CBR #6 with 5% Lime added; Boring #27 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. CBR

AT Optimum Moisture Content



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-07 (At Optimum Moisture Content)

CBR #6 with 7% Lime added; Boring #27 @ 2.0 - 4.0'
Dark Brown Sandy Lean Clay (CL)

January 16, 2019

10 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	97.7
Moisture content, %, before soak	15.6
Moisture content, %, after soak, avg.	24.4
Moisture content, %, after soak, top 1"	26.4
Expansion, %, 96 hour soak	0.2
Bearing Ratio, 0.100" penetration	27.1

25 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	105.4
Moisture content, %, before soak	15.6
Moisture content, %, after soak, avg.	20.9
Moisture content, %, after soak, top 1"	24.4
Expansion, %, 96 hour soak	0.2
Bearing Ratio, 0.100" penetration	49.2

56 BLOWS PER LIFT

	Optimum Moisture
Dry density, pcf, before soak	114.0
Moisture content, %, before soak	15.6
Moisture content, %, after soak, avg.	18.0
Moisture content, %, after soak, top 1"	22.8
Expansion, %, 96 hour soak	0.1
Bearing Ratio, 0.100" penetration	85.8

Oxnard Airport - Runway and Taxiway
Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

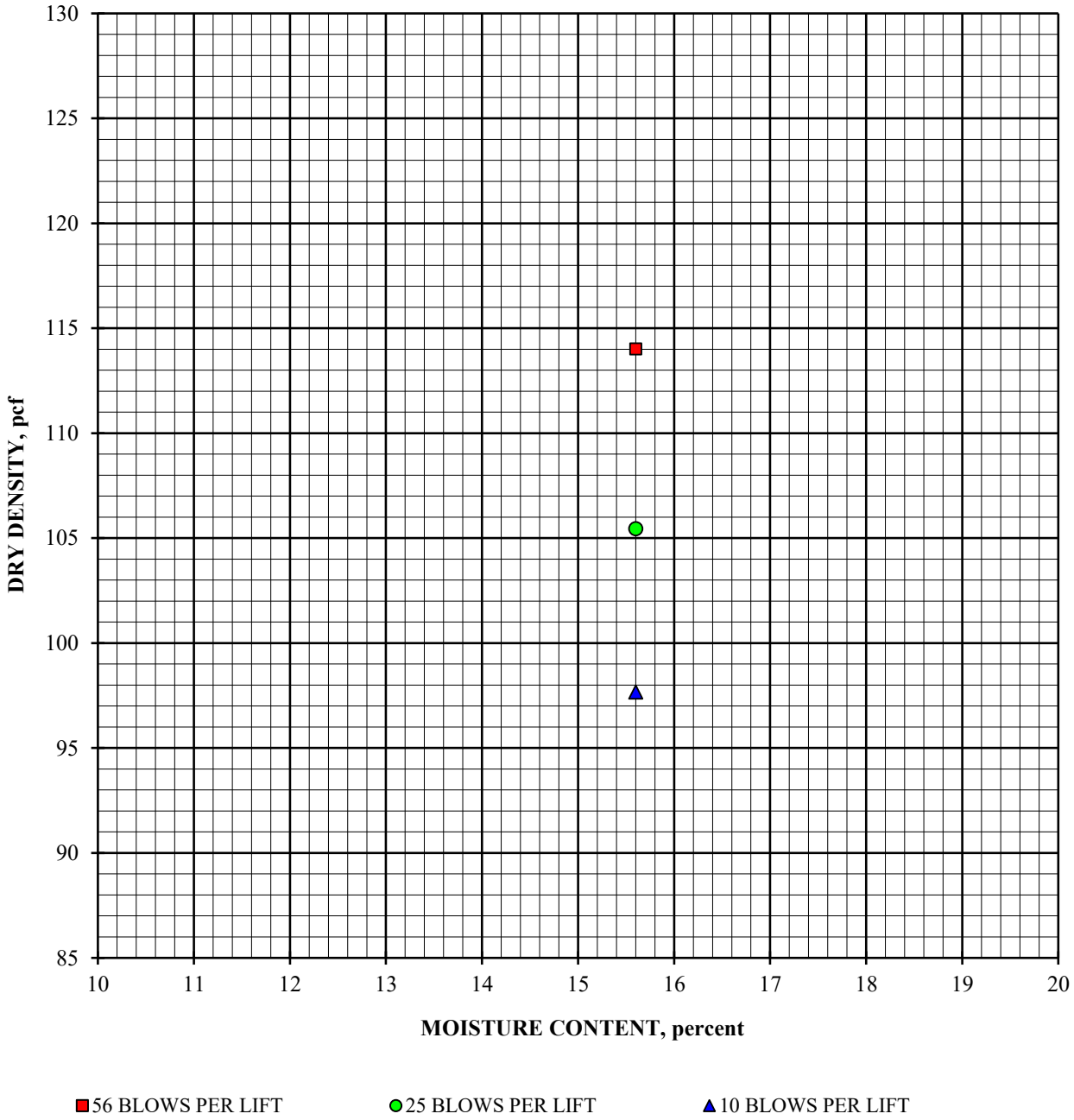
ASTM D 1883-07 (At Optimum Moisture Content)

CBR #6 with 7% Lime added; Boring #27 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway and Taxiway
Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

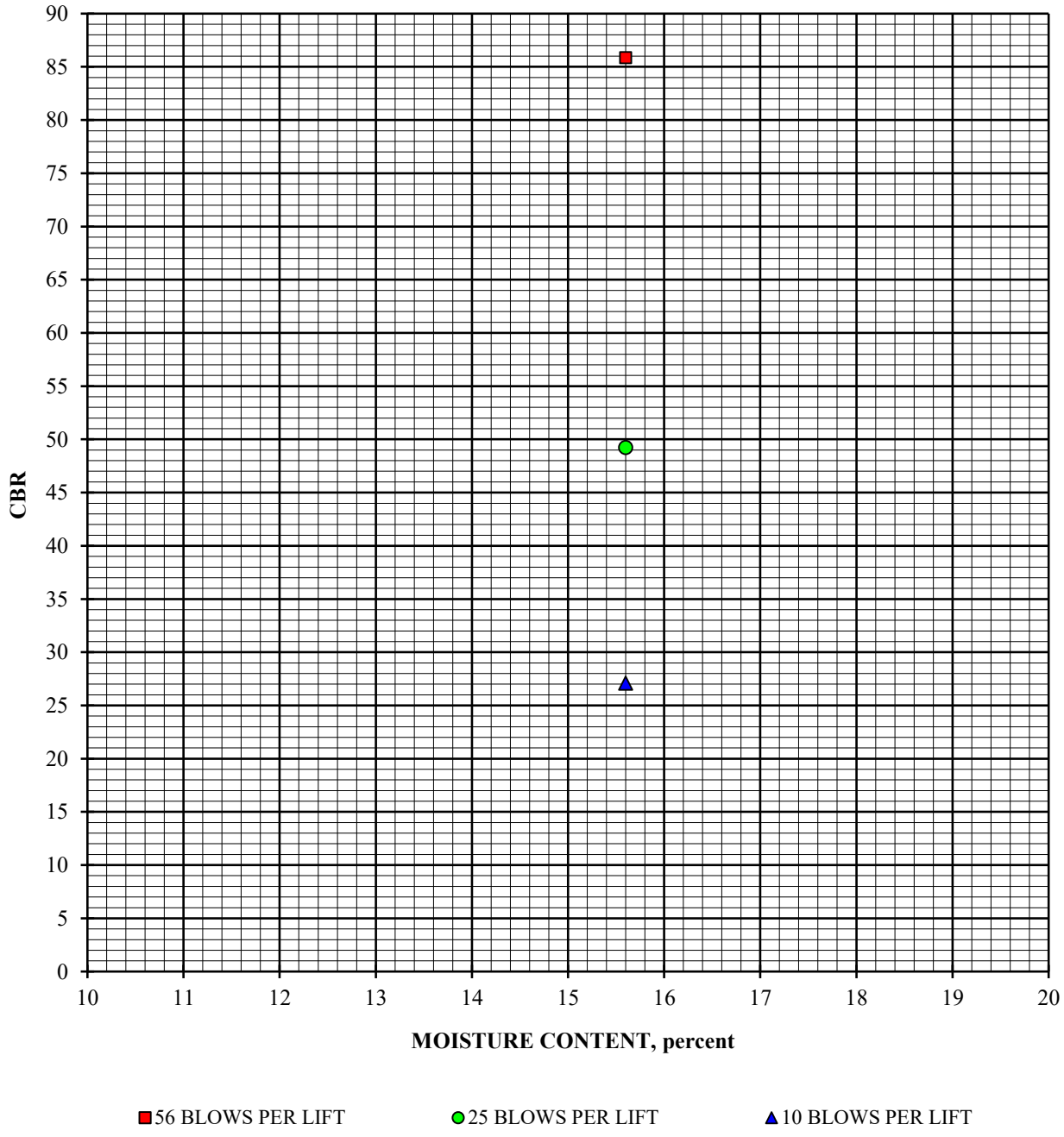
ASTM D 1883-07 (At Optimum Moisture Content)

CBR #6 with 7% Lime added; Boring #27 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Sandy Lean Clay (CL)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway and Taxiway Rehabilitation / Reconstruction

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-07 (At Optimum Moisture Content)

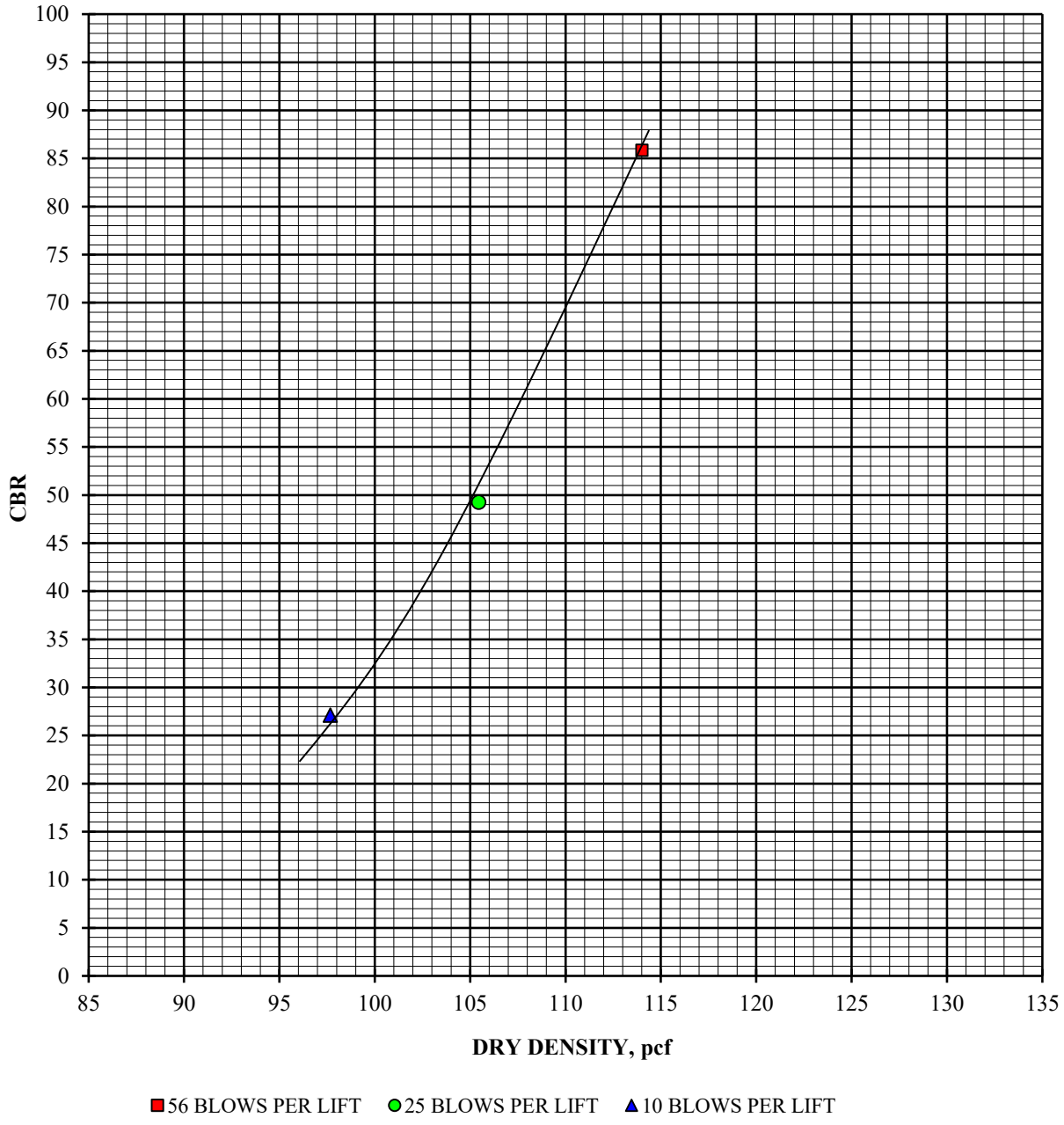
CBR #6 with 7% Lime added; Boring #27 @ 2.0 - 4.0'

January 16, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. CBR

AT Optimum Moisture Content



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #7; Boring #23 @ 3.5 - 5.0'
Brown Sandy Lean Clay (CL)

January 8, 2019

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	101.0	105.0	105.1
Moisture content, %, before soak	7.0	10.0	13.0
Moisture content, %, after soak, avg.	22.9	19.3	21.3
Moisture content, %, after soak, top 1"	26.2	23.5	25.3
Expansion, %, 96 hour soak	5.8	0.5	0.0
Bearing Ratio, 0.100" penetration	1.7	2.2	2.2

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	110.0	117.5	115.4
Moisture content, %, before soak	7.0	10.0	13.0
Moisture content, %, after soak, avg.	16.7	15.1	17.2
Moisture content, %, after soak, top 1"	23.7	20.3	20.5
Expansion, %, 96 hour soak	3.0	0.2	0.0
Bearing Ratio, 0.100" penetration	2.6	7.8	7.4

56 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	118.4	123.5	119.8
Moisture content, %, before soak	7.0	10.0	13.0
Moisture content, %, after soak, avg.	15.2	12.2	14.6
Moisture content, %, after soak, top 1"	18.6	14.8	15.7
Expansion, %, 96 hour soak	3.0	0.1	0.0
Bearing Ratio, 0.100" penetration	7.6	19.4	17.4

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

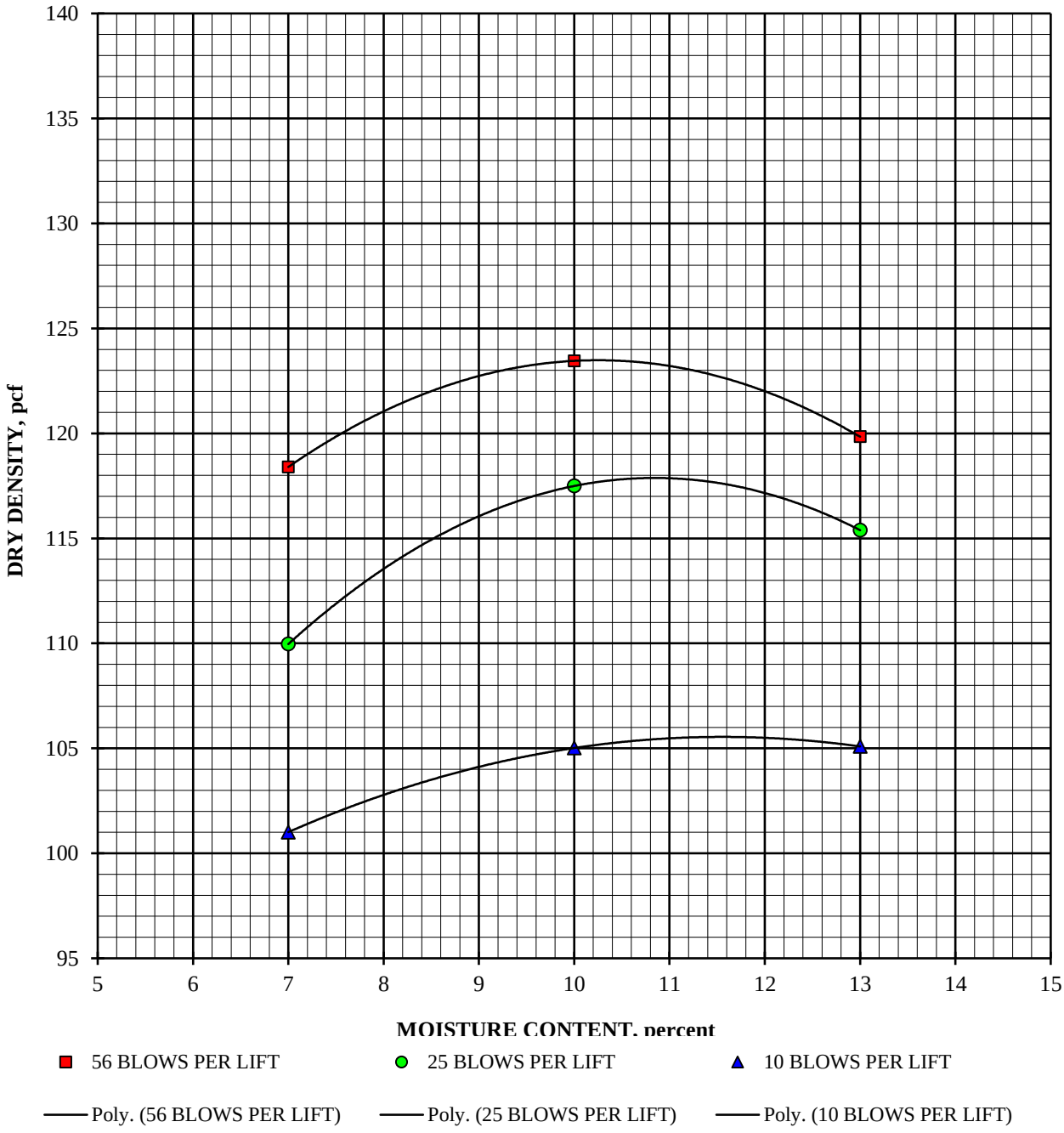
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #7; Boring #23 @ 3.5 - 5.0'

January 8, 2019

Brown Sandy Lean Clay (CL)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

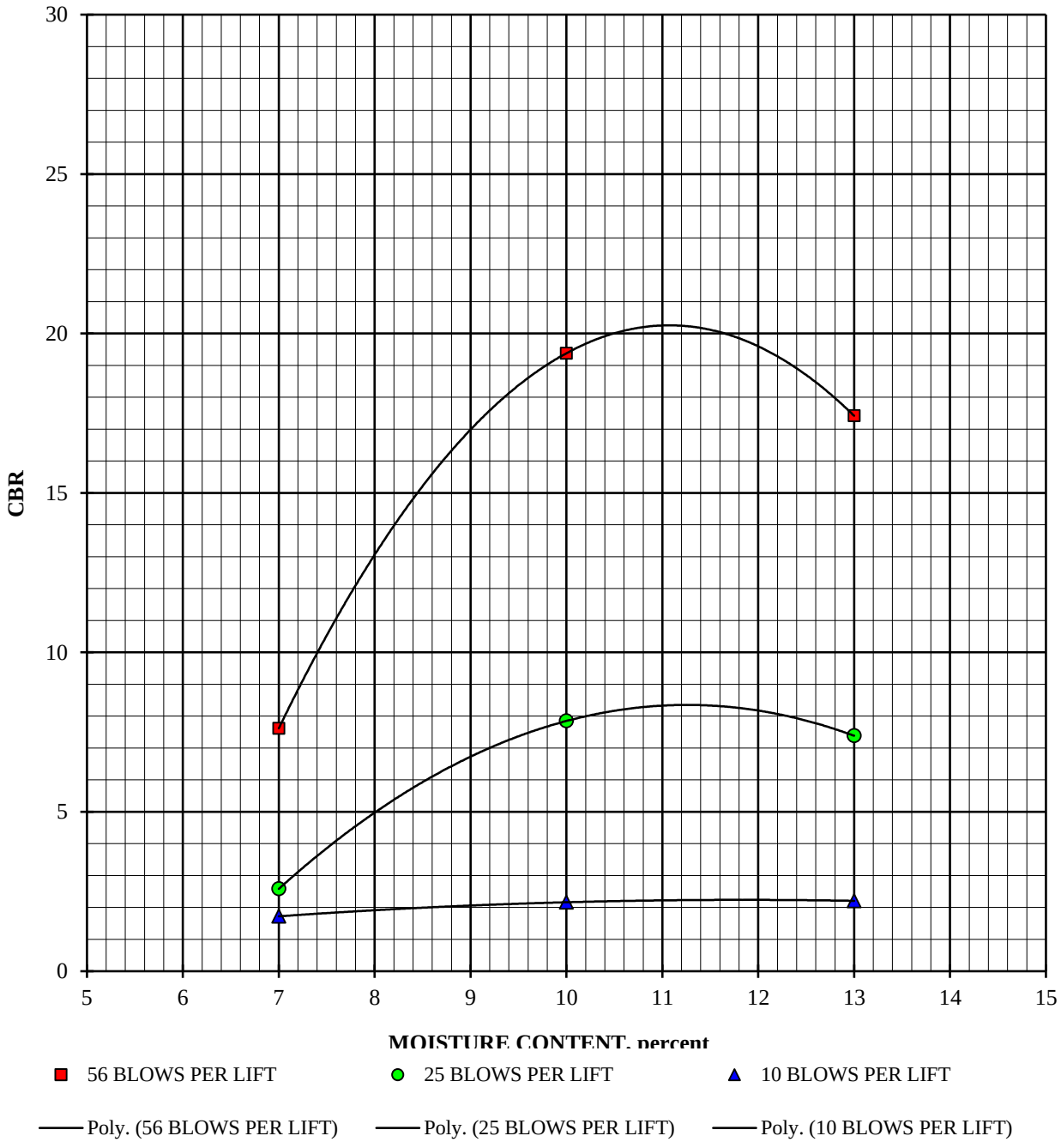
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #7; Boring #23 @ 3.5 - 5.0'

January 8, 2019

Brown Sandy Lean Clay (CL)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

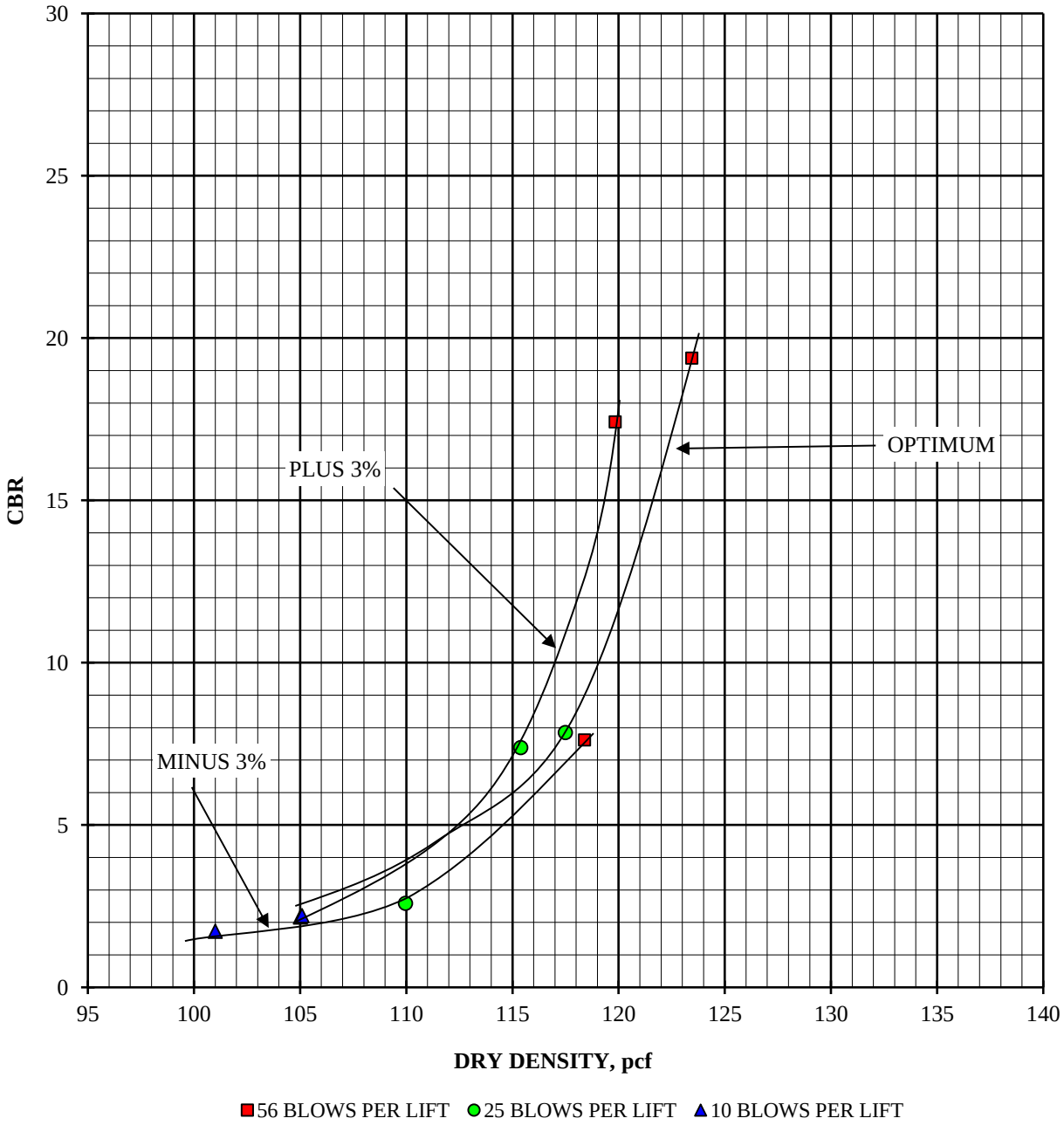
CBR #7; Boring #23 @ 3.5 - 5.0'

January 8, 2019

Brown Sandy Lean Clay (CL)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #8; Boring #29 @ 2.0 - 5.0'
Brown / Gray Mottled Sandy Lean Clay (CL)

January 8, 2019

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	108.3	108.9	107.1
Moisture content, %, before soak	8.9	11.9	14.9
Moisture content, %, after soak, avg.	15.9	12.9	23.5
Moisture content, %, after soak, top 1"	20.4	18.3	17.7
Expansion, %, 96 hour soak	0.7	0.4	0.1
Bearing Ratio, 0.100" penetration	4.6	6.8	2.6

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	120.3	121.8	115.8
Moisture content, %, before soak	8.9	11.9	14.9
Moisture content, %, after soak, avg.	12.6	14.0	15.4
Moisture content, %, after soak, top 1"	16.8	15.6	16.5
Expansion, %, 96 hour soak	0.6	0.3	0.7
Bearing Ratio, 0.100" penetration	17.7	27.9	3.2

56 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	121.7	122.9	115.5
Moisture content, %, before soak	8.9	11.9	14.9
Moisture content, %, after soak, avg.	16.3	12.4	15.2
Moisture content, %, after soak, top 1"	13.8	15.1	16.8
Expansion, %, 96 hour soak	0.6	0.4	0.0
Bearing Ratio, 0.100" penetration	19.7	27.5	2.8

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

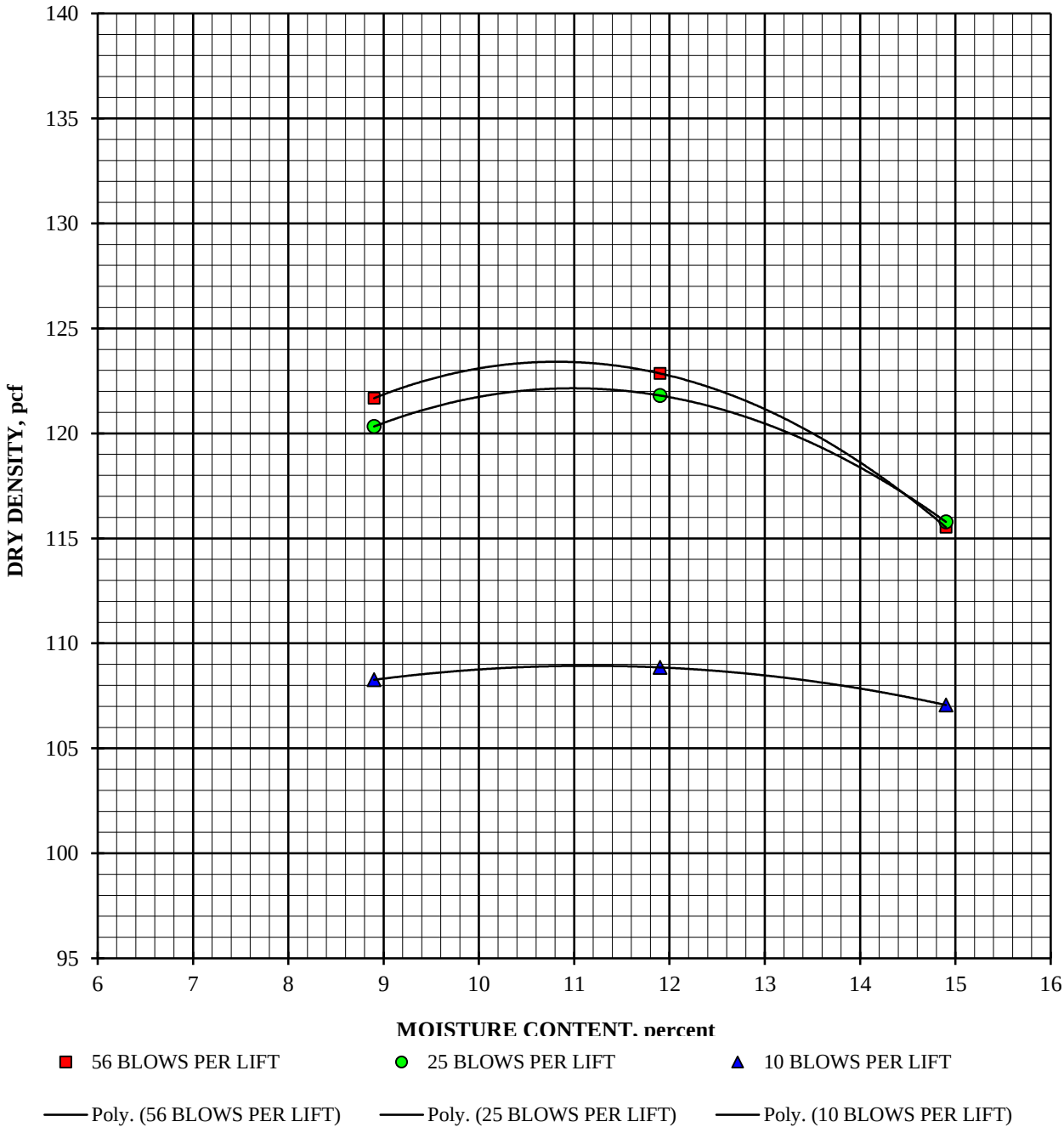
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #8; Boring #29 @ 2.0 - 5.0'

January 8, 2019

Brown / Gray Mottled Sandy Lean Clay (CL)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

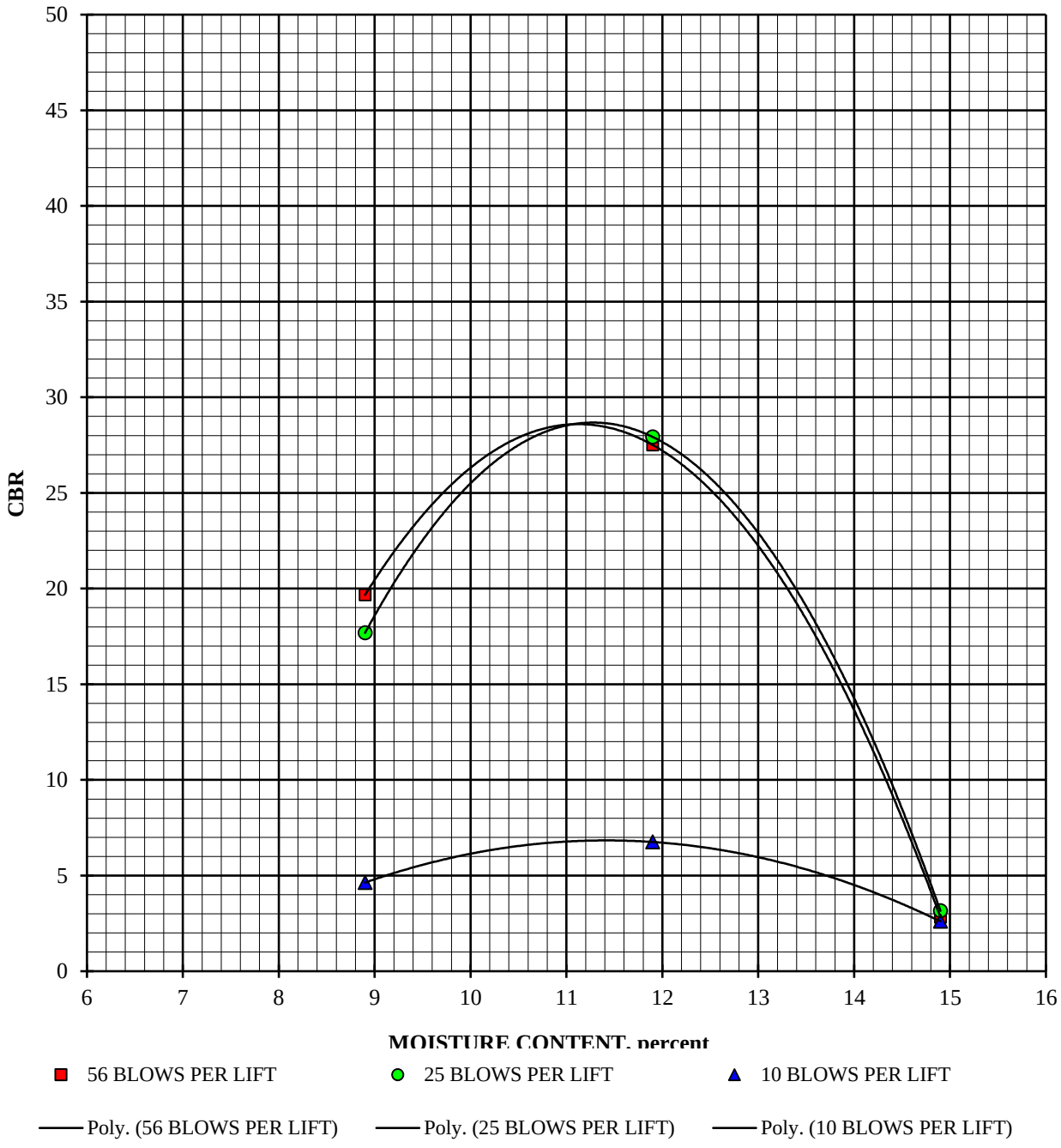
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #8; Boring #29 @ 2.0 - 5.0'

January 8, 2019

Brown / Gray Mottled Sandy Lean Clay (CL)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

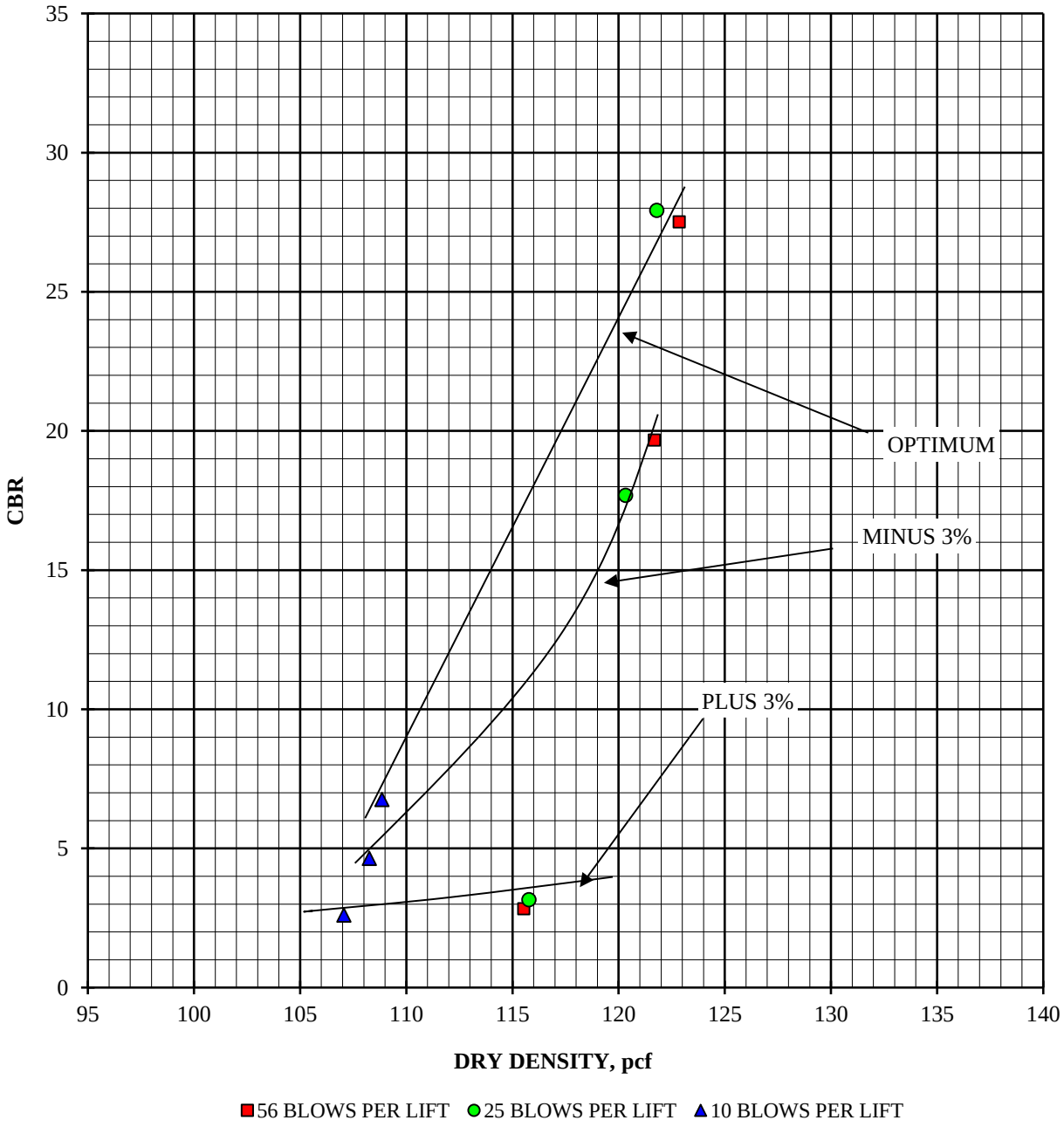
CBR #8; Boring #29 @ 2.0 - 5.0'

January 8, 2019

Brown / Gray Mottled Sandy Lean Clay (CL)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #9; Boring #21 @ 1.5 - 3.0'
Brown Sandy Lean Clay (CL)

January 8, 2019

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	108.6	112.7	110.8
Moisture content, %, before soak	10.4	13.4	16.4
Moisture content, %, after soak, avg.	15.2	15.6	17.2
Moisture content, %, after soak, top 1"	19.1	22.8	19.8
Expansion, %, 96 hour soak	0.4	0.1	0.1
Bearing Ratio, 0.100" penetration	3.3	5.0	4.7

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	113.9	117.6	110.1
Moisture content, %, before soak	10.4	13.4	16.4
Moisture content, %, after soak, avg.	20.2	16.1	17.7
Moisture content, %, after soak, top 1"	17.3	18.8	19.1
Expansion, %, 96 hour soak	0.2	0.1	0.2
Bearing Ratio, 0.100" penetration	12.8	14.3	3.9

56 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	118.2	119.9	110.9
Moisture content, %, before soak	10.4	13.4	16.4
Moisture content, %, after soak, avg.	17.4	14.5	14.6
Moisture content, %, after soak, top 1"	16.2	15.8	18.9
Expansion, %, 96 hour soak	0.3	0.1	0.0
Bearing Ratio, 0.100" penetration	17.8	17.9	3.0

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

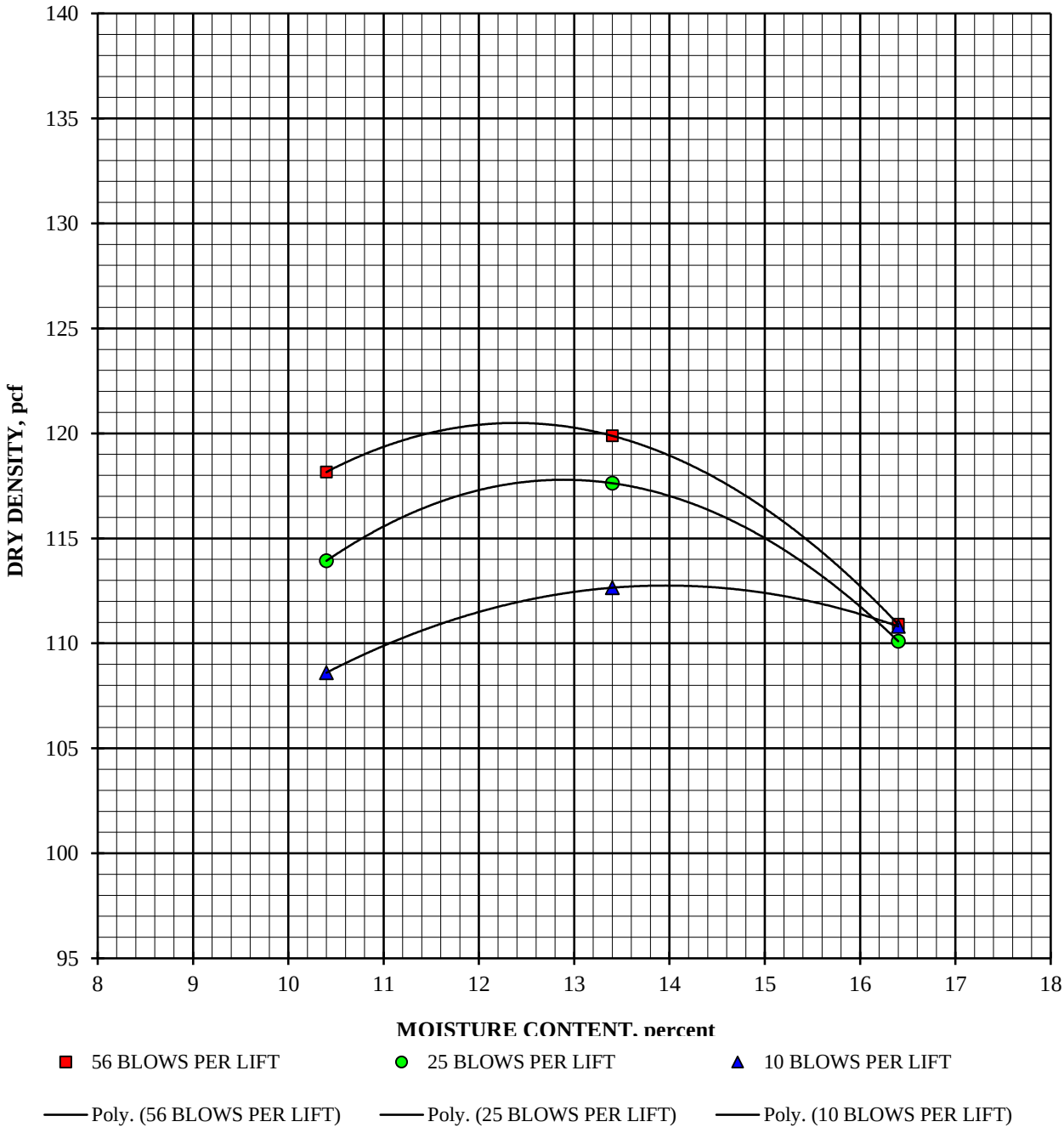
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #9; Boring #21 @ 1.5 - 3.0'

January 8, 2019

Brown Sandy Lean Clay (CL)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

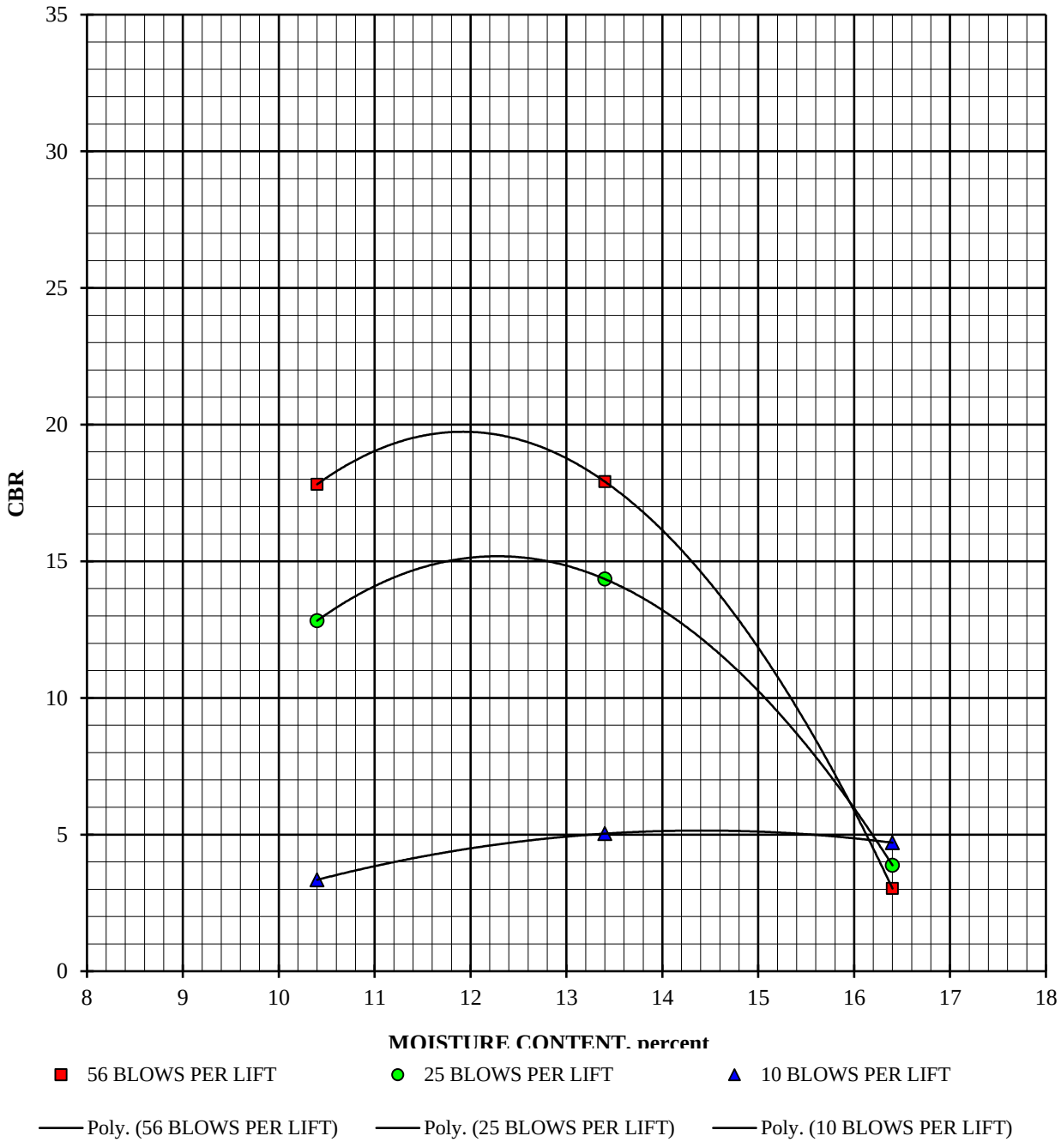
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #9; Boring #21 @ 1.5 - 3.0'

January 8, 2019

Brown Sandy Lean Clay (CL)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

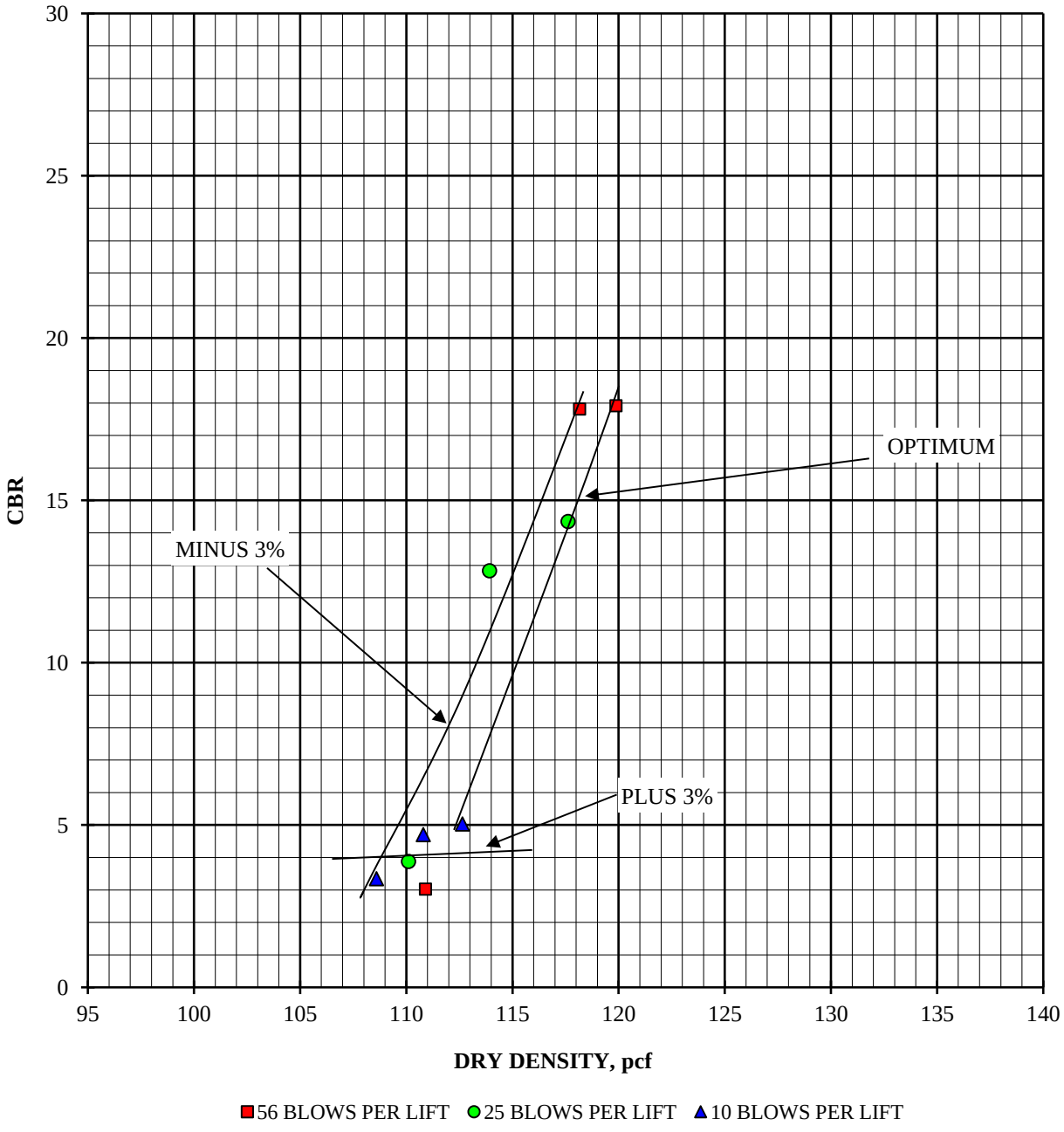
CBR #9; Boring #21 @ 1.5 - 3.0'

January 8, 2019

Brown Sandy Lean Clay (CL)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #11; Boring #16 @ 2.0 - 4.0'
Dark Brown Sandy Lean Clay (CL)

January 8, 2019

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	107.9	109.0	107.4
Moisture content, %, before soak	10.7	13.7	16.7
Moisture content, %, after soak, avg.	18.6	17.4	20.1
Moisture content, %, after soak, top 1"	22.6	22.3	21.7
Expansion, %, 96 hour soak	0.4	0.2	0.0
Bearing Ratio, 0.100" penetration	3.6	5.9	3.0

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	112.3	114.4	110.2
Moisture content, %, before soak	10.7	13.7	16.7
Moisture content, %, after soak, avg.	20.3	16.2	19.2
Moisture content, %, after soak, top 1"	18.8	18.1	20.7
Expansion, %, 96 hour soak	0.3	0.2	0.0
Bearing Ratio, 0.100" penetration	8.7	10.0	3.2

56 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	113.0	114.6	111.1
Moisture content, %, before soak	10.7	13.7	16.7
Moisture content, %, after soak, avg.	22.1	16.5	18.3
Moisture content, %, after soak, top 1"	20.6	17.5	20.9
Expansion, %, 96 hour soak	0.4	0.2	0.0
Bearing Ratio, 0.100" penetration	10.9	12.1	2.9

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

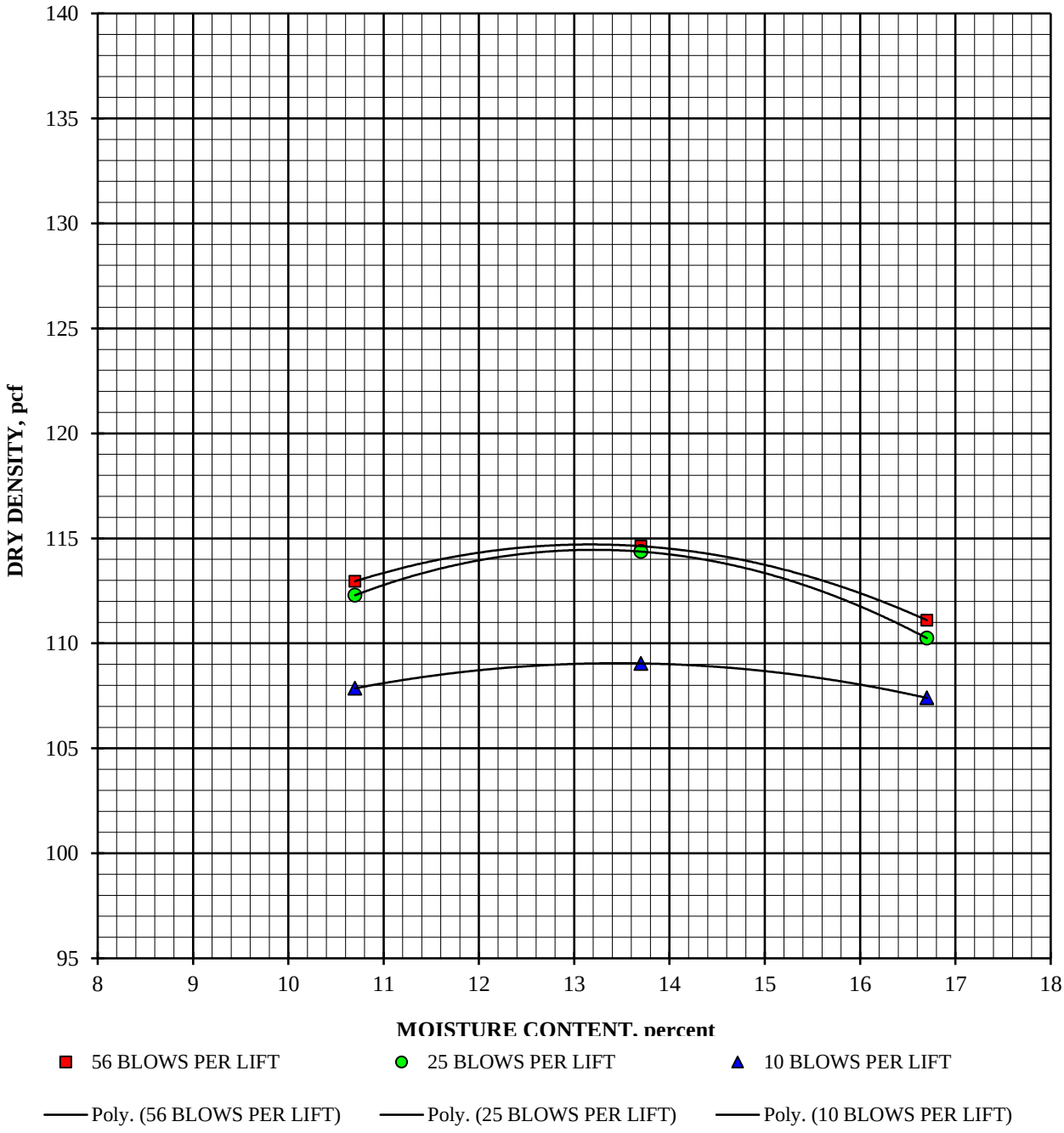
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #11; Boring #16 @ 2.0 - 4.0'

January 8, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

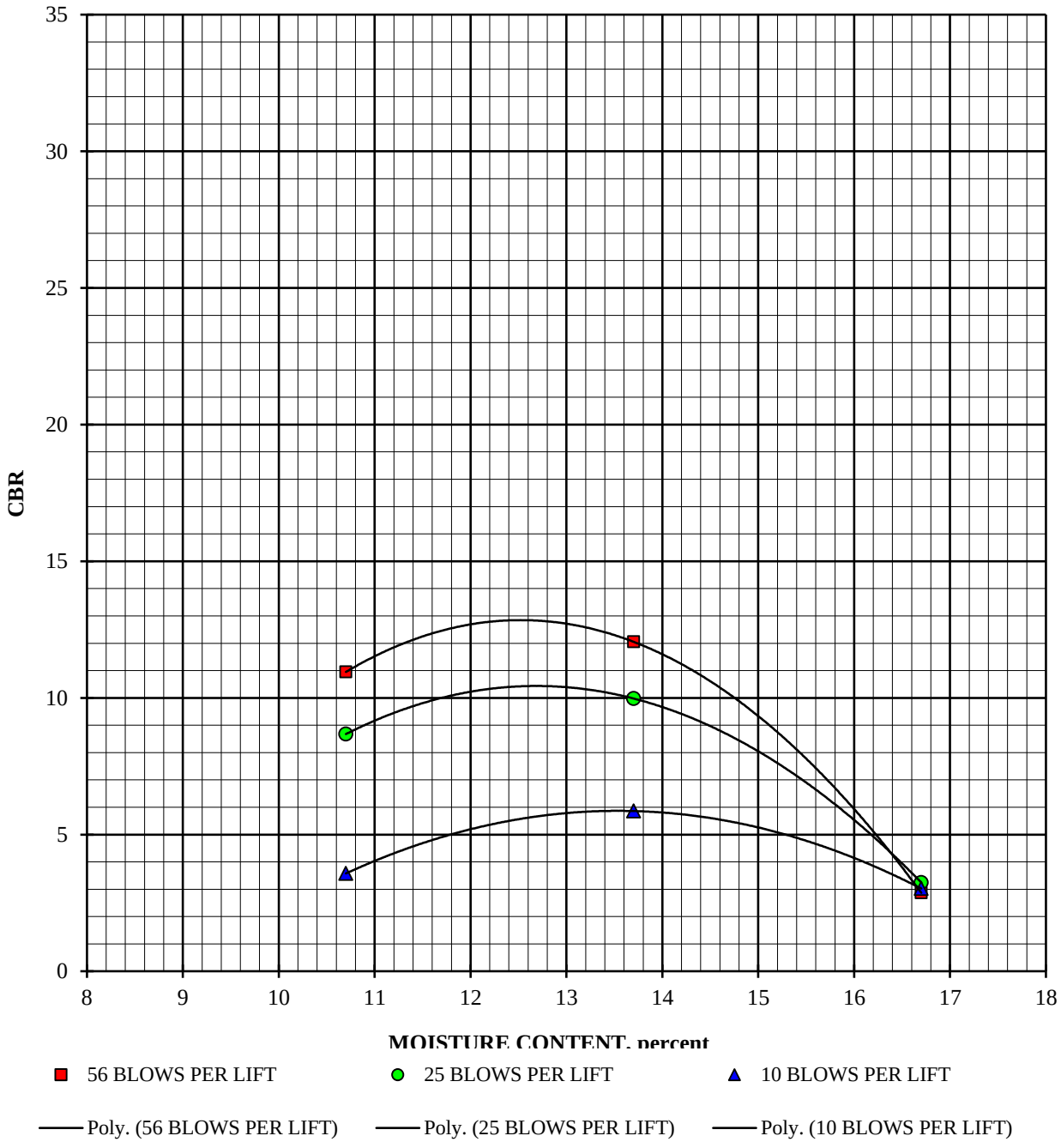
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #11; Boring #16 @ 2.0 - 4.0'

January 8, 2019

Dark Brown Sandy Lean Clay (CL)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

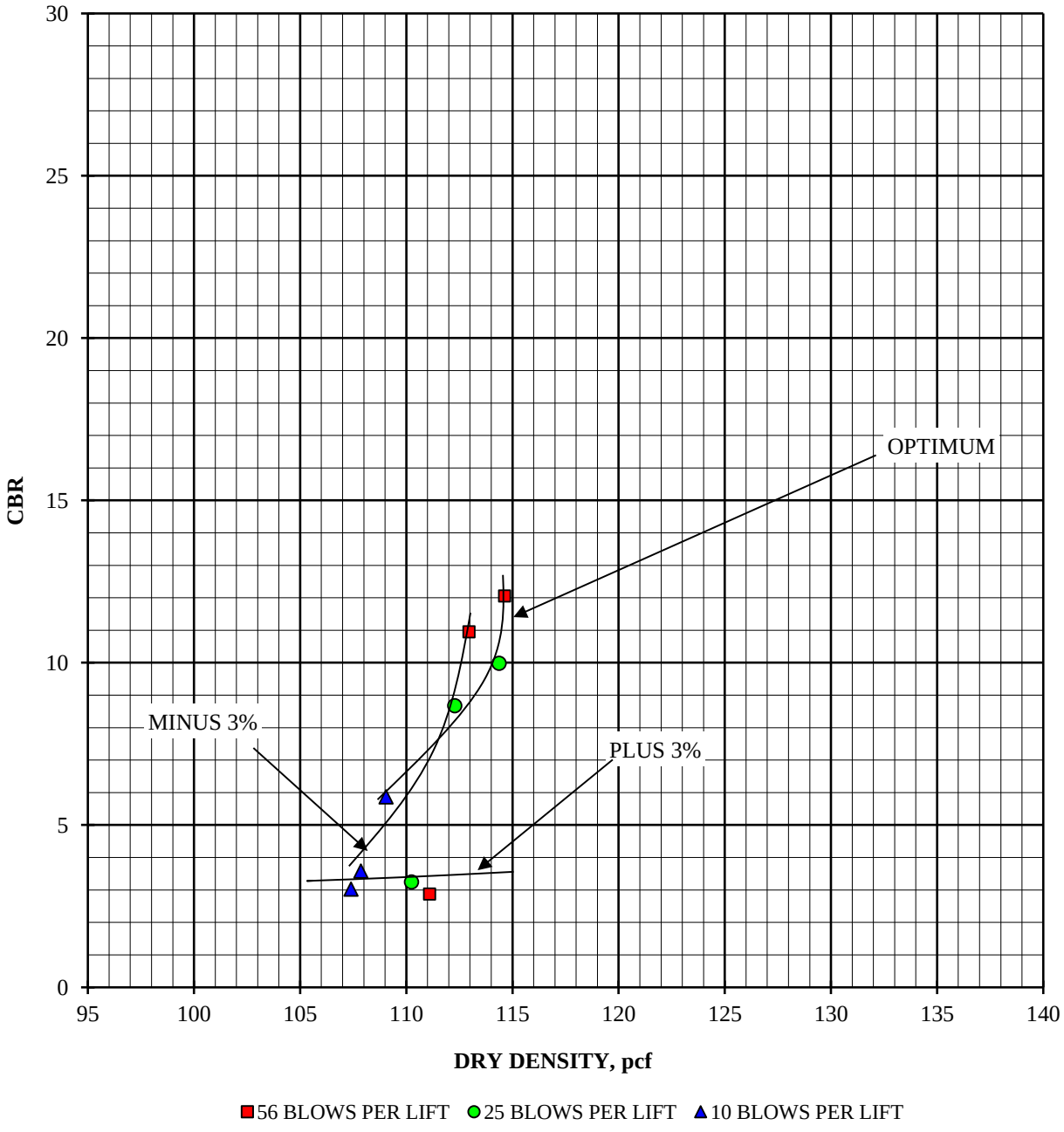
CBR #11; Boring #16 @ 2.0 - 4.0'

January 8, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #12; Boring #13 @ 2.0 - 4.0'
Dark Brown Sandy Lean Clay (CL)

January 8, 2019

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	100.6	103.3	103.8
Moisture content, %, before soak	13.5	16.5	19.5
Moisture content, %, after soak, avg.	24.8	22.0	20.5
Moisture content, %, after soak, top 1"	30.7	25.3	23.8
Expansion, %, 96 hour soak	0.5	0.1	0.0
Bearing Ratio, 0.100" penetration	2.5	5.9	4.6

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	111.4	111.7	106.0
Moisture content, %, before soak	13.5	16.5	19.5
Moisture content, %, after soak, avg.	15.8	18.3	19.7
Moisture content, %, after soak, top 1"	23.8	20.9	22.8
Expansion, %, 96 hour soak	0.2	0.1	0.0
Bearing Ratio, 0.100" penetration	10.5	15.2	4.6

56 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	112.2	112.6	105.8
Moisture content, %, before soak	13.5	16.5	19.5
Moisture content, %, after soak, avg.	21.0	19.2	19.8
Moisture content, %, after soak, top 1"	17.7	18.8	22.8
Expansion, %, 96 hour soak	0.5	0.0	0.0
Bearing Ratio, 0.100" penetration	13.6	15.8	4.3

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

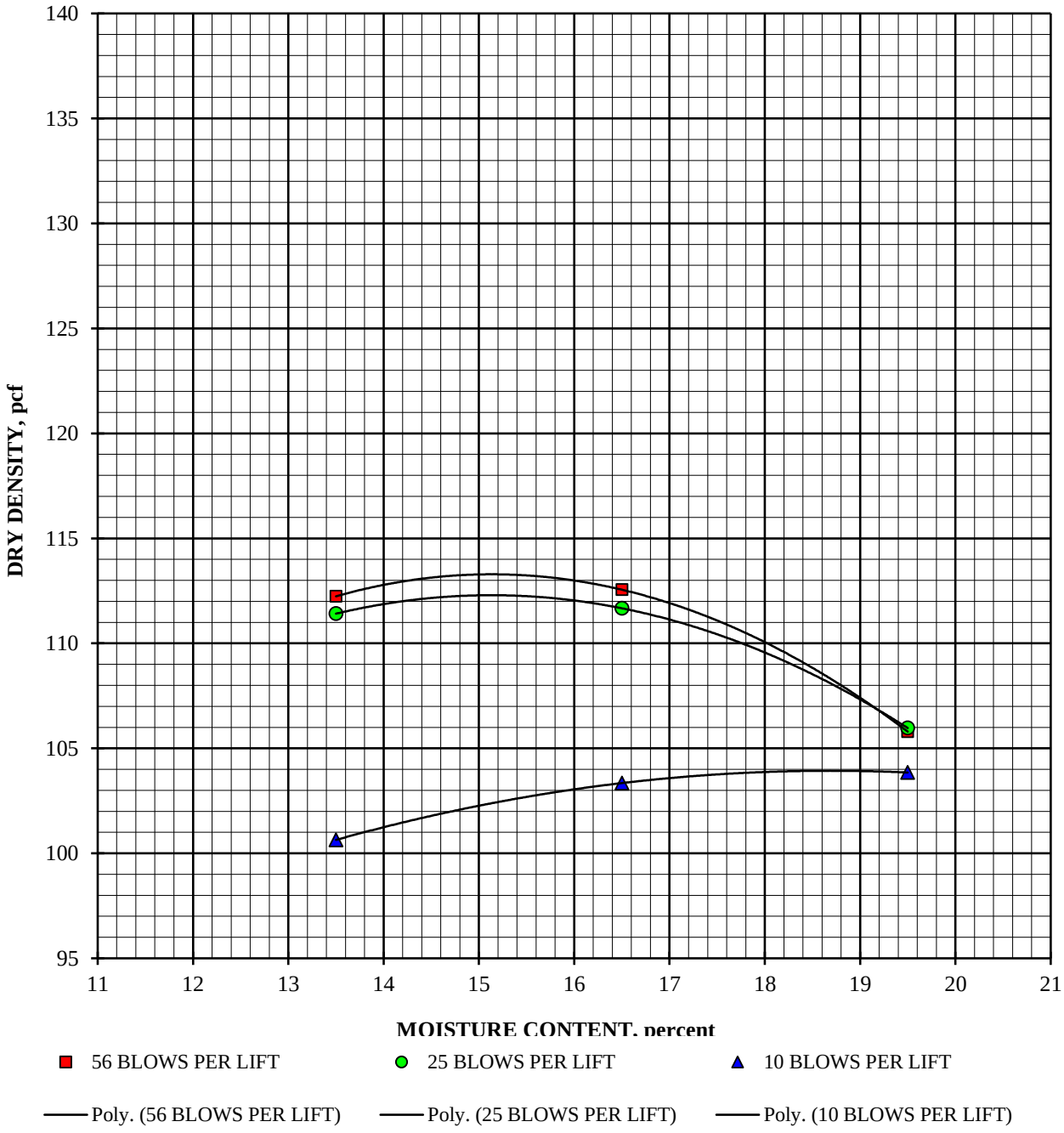
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #12; Boring #13 @ 2.0 - 4.0'

January 8, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

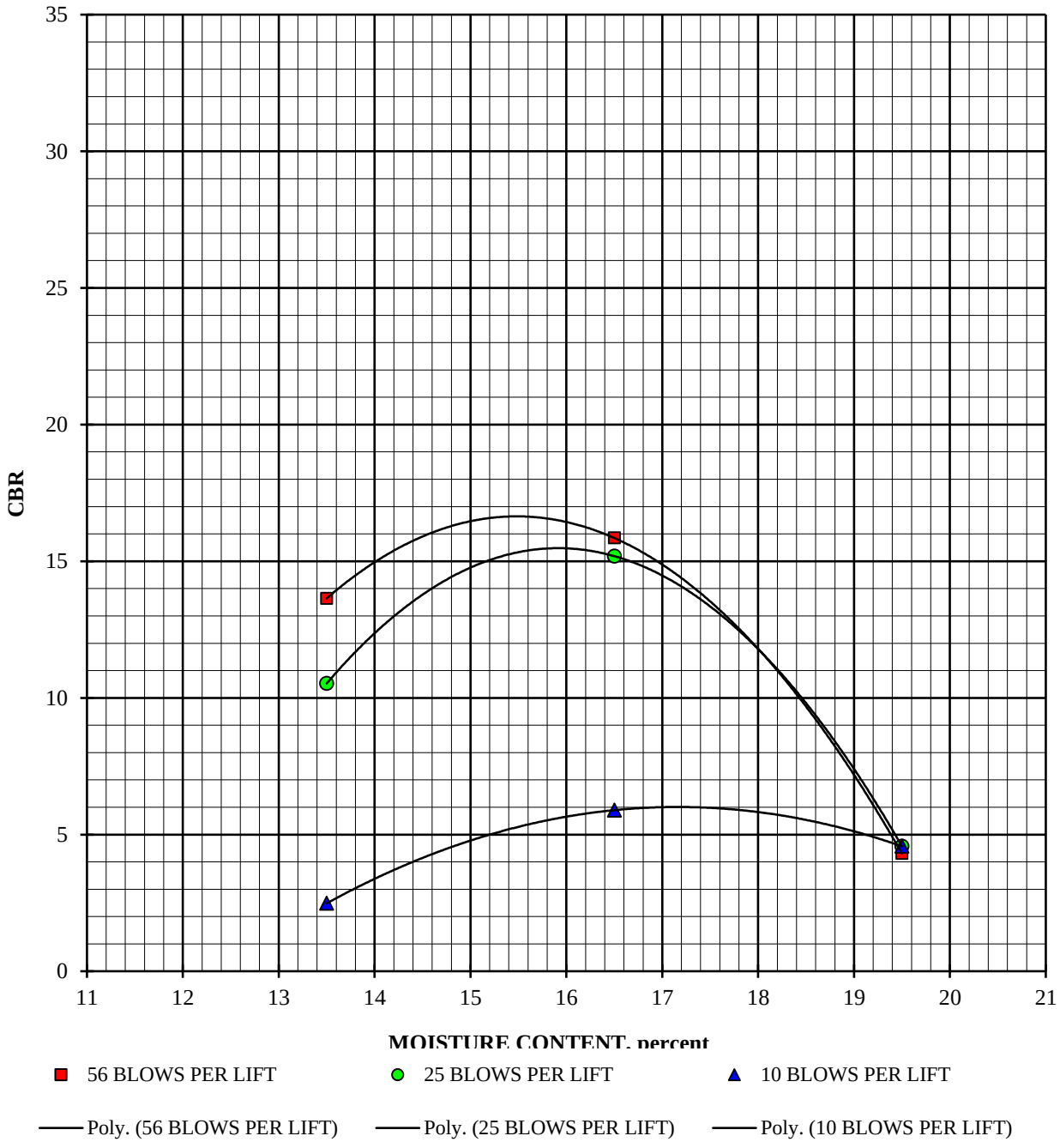
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #12; Boring #13 @ 2.0 - 4.0'

January 8, 2019

Dark Brown Sandy Lean Clay (CL)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

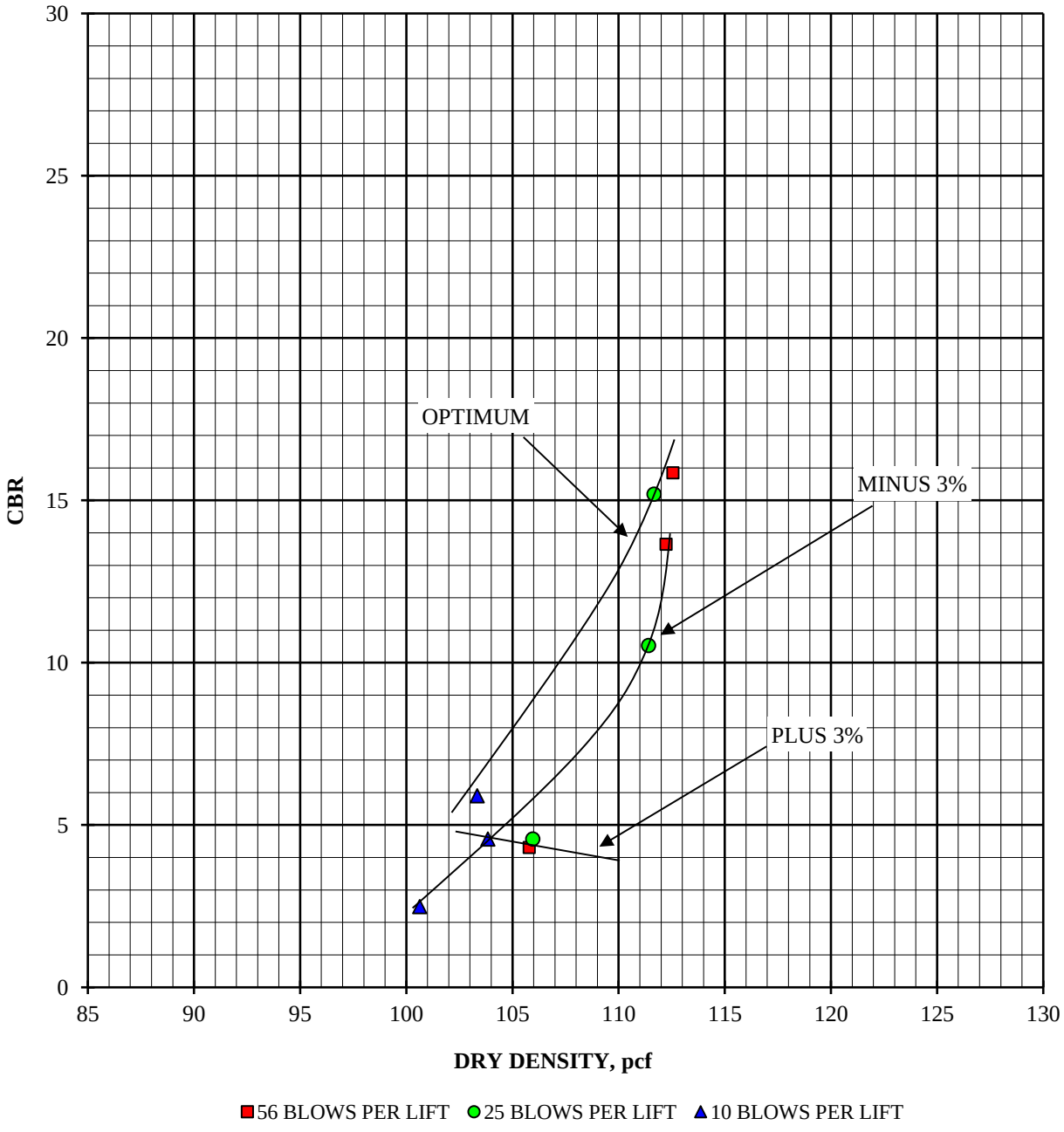
CBR #12; Boring #13 @ 2.0 - 4.0'

January 8, 2019

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #13; Boring #40 @ 1.5 - 3.5'
Brown Silty Sand (SM)

January 8, 2019

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	115.8	119.0	116.3
Moisture content, %, before soak	6.2	9.2	12.2
Moisture content, %, after soak, avg.	14.9	11.8	18.8
Moisture content, %, after soak, top 1"	19.3	15.9	14.0
Expansion, %, 96 hour soak	0.2	0.1	0.0
Bearing Ratio, 0.100" penetration	4.9	15.3	6.7

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	122.8	127.8	120.4
Moisture content, %, before soak	6.2	9.2	12.2
Moisture content, %, after soak, avg.	11.1	10.4	12.5
Moisture content, %, after soak, top 1"	15.1	11.4	13.0
Expansion, %, 96 hour soak	0.4	0.1	0.0
Bearing Ratio, 0.100" penetration	16.9	25.3	4.8

56 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	123.0	129.2	121.2
Moisture content, %, before soak	6.2	9.2	12.2
Moisture content, %, after soak, avg.	15.6	11.7	14.1
Moisture content, %, after soak, top 1"	13.3	10.4	12.4
Expansion, %, 96 hour soak	0.5	0.2	0.0
Bearing Ratio, 0.100" penetration	26.2	35.0	4.6

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

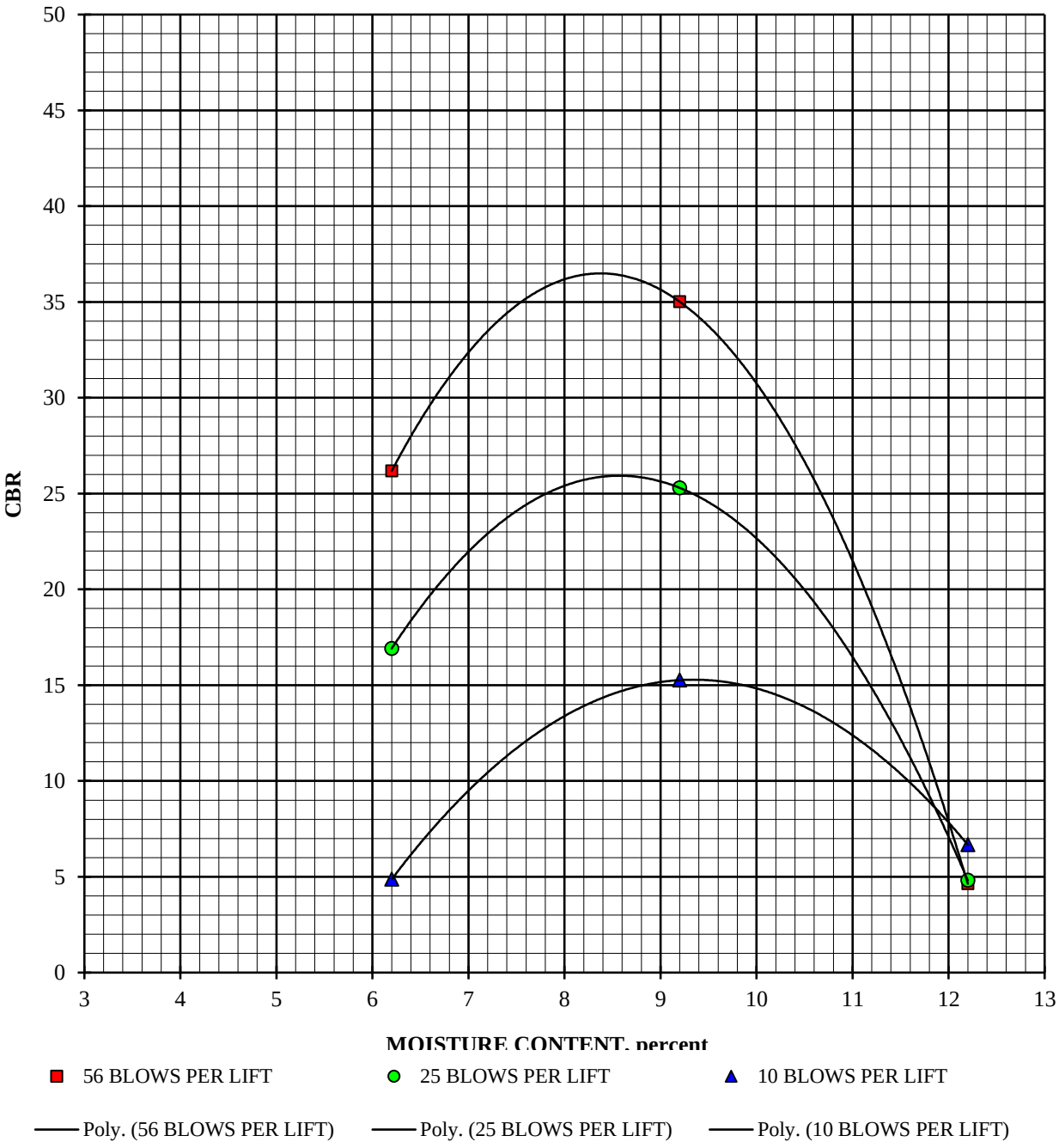
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #13; Boring #40 @ 1.5 - 3.5'

January 8, 2019

Brown Silty Sand (SM)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

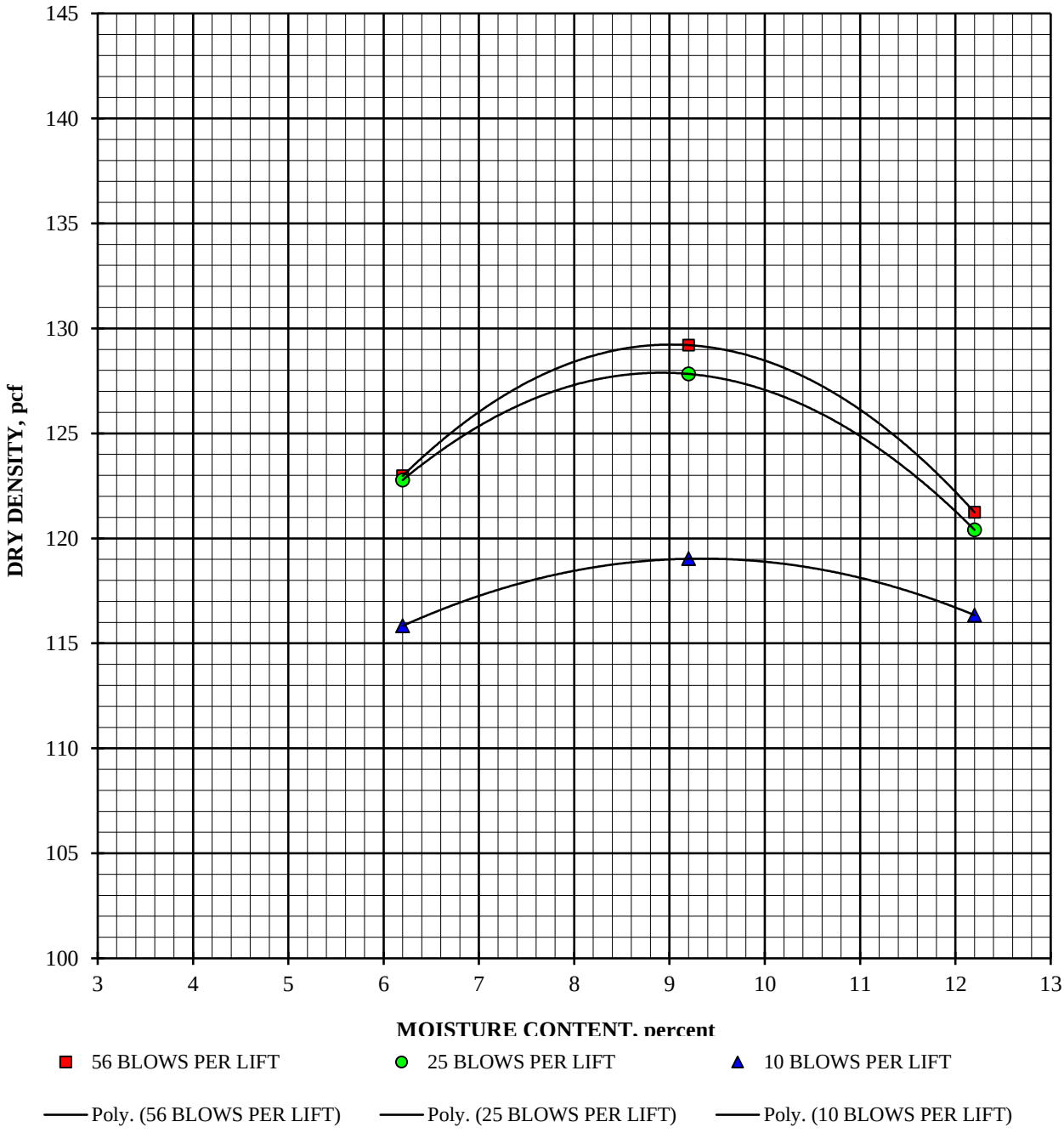
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #13; Boring #40 @ 1.5 - 3.5'

January 8, 2019

Brown Silty Sand (SM)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

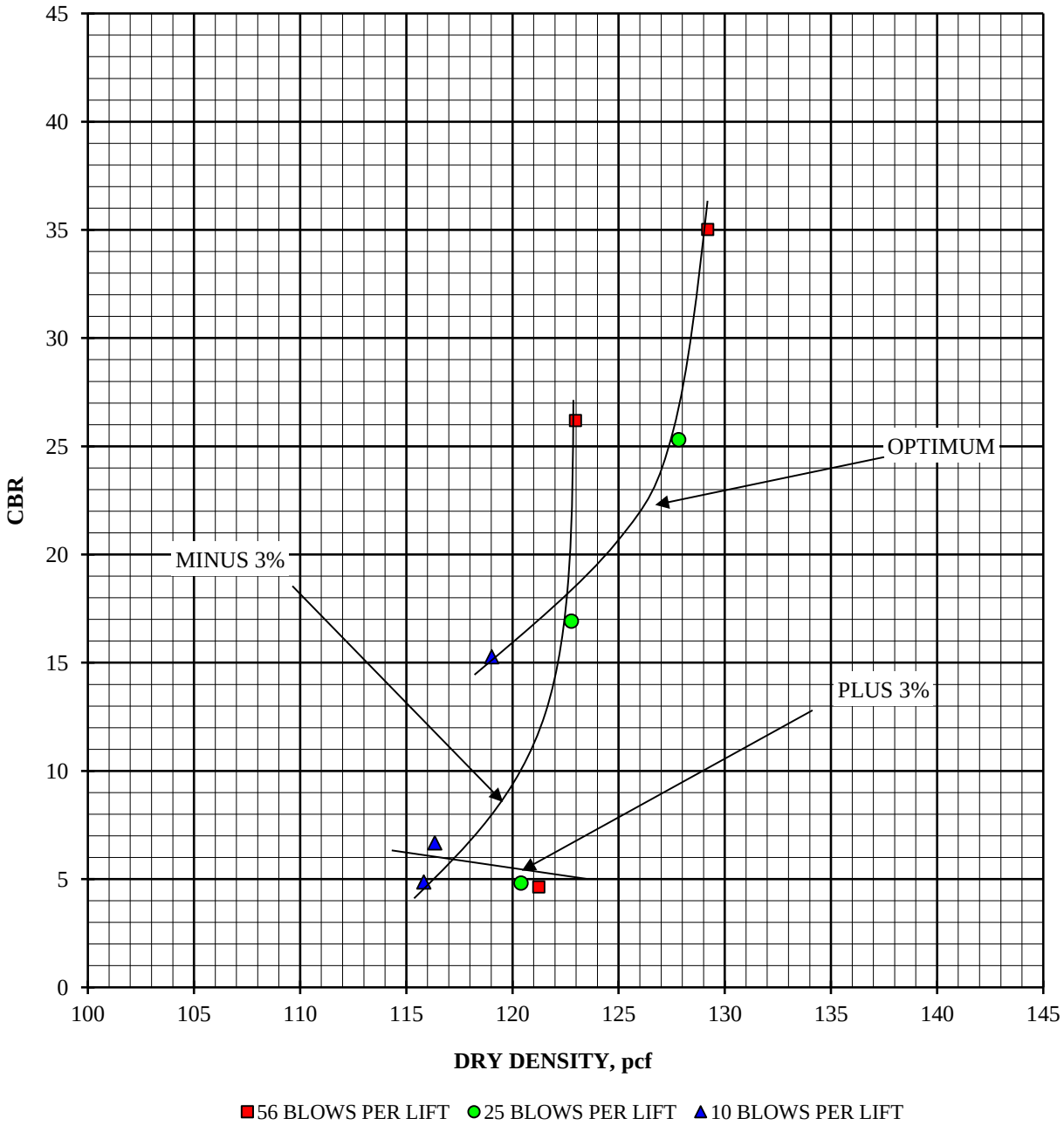
CBR #13; Boring #40 @ 1.5 - 3.5'

January 8, 2019

Brown Silty Sand (SM)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #14; Boring #39 @ 2.0 - 5.0'
Brown Sandy Fat Clay (CH)

January 8, 2019

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	105.6	110.2	106.0
Moisture content, %, before soak	6.6	9.6	12.6
Moisture content, %, after soak, avg.	20.5	17.4	24.2
Moisture content, %, after soak, top 1"	22.2	21.4	17.8
Expansion, %, 96 hour soak	5.3	3.1	2.2
Bearing Ratio, 0.100" penetration	2.0	3.2	2.2

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	115.3	117.5	116.0
Moisture content, %, before soak	6.6	9.6	12.6
Moisture content, %, after soak, avg.	16.8	15.3	13.9
Moisture content, %, after soak, top 1"	21.9	17.9	17.2
Expansion, %, 96 hour soak	3.3	2.0	0.0
Bearing Ratio, 0.100" penetration	3.8	5.5	4.6

56 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	118.2	123.8	117.2
Moisture content, %, before soak	6.6	9.6	12.6
Moisture content, %, after soak, avg.	20.0	13.1	13.2
Moisture content, %, after soak, top 1"	19.5	18.0	17.7
Expansion, %, 96 hour soak	4.1	1.6	0.0
Bearing Ratio, 0.100" penetration	6.7	14.7	3.4

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

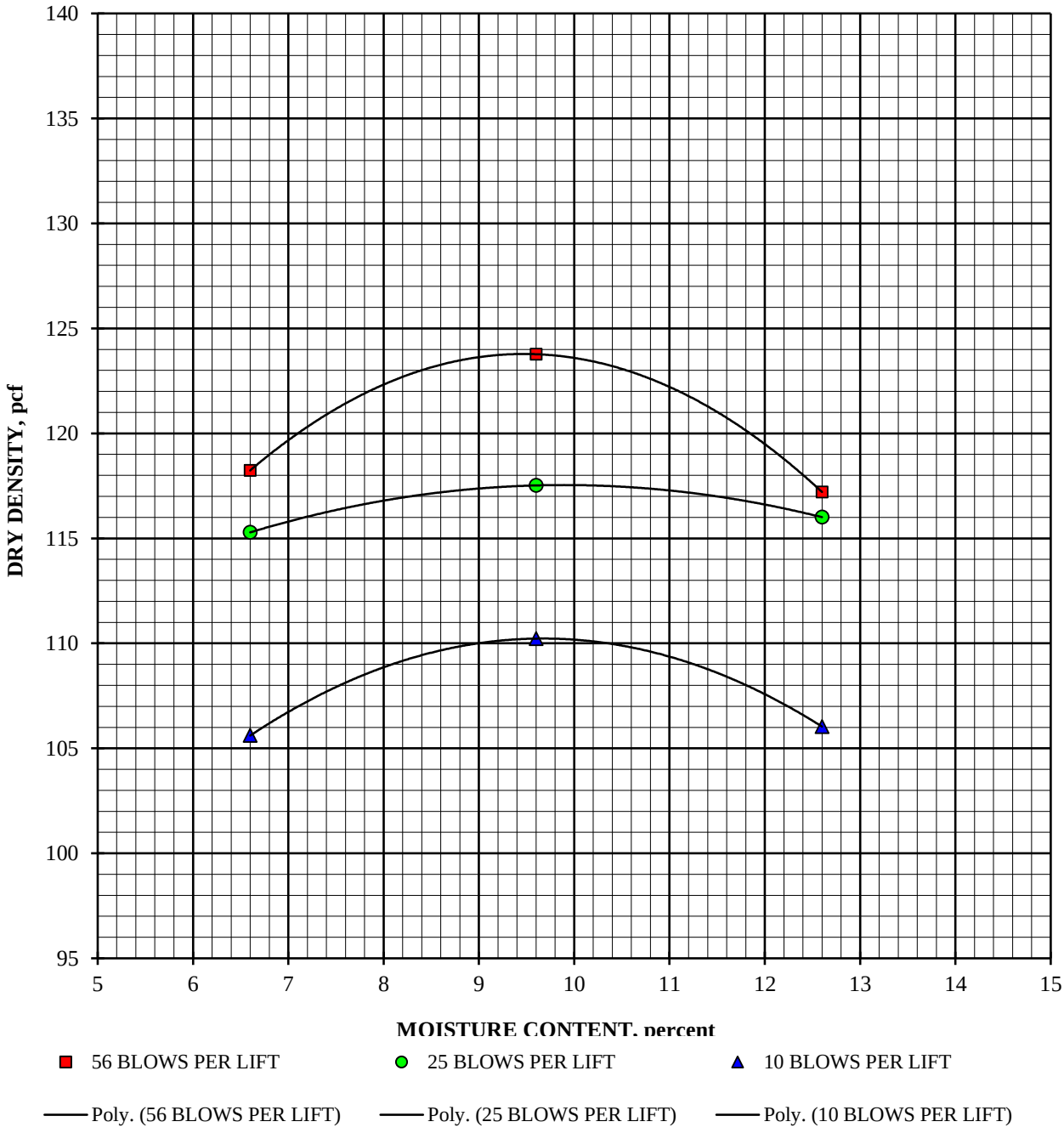
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #14; Boring #39 @ 2.0 - 5.0'

January 8, 2019

Brown Sandy Fat Clay (CH)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

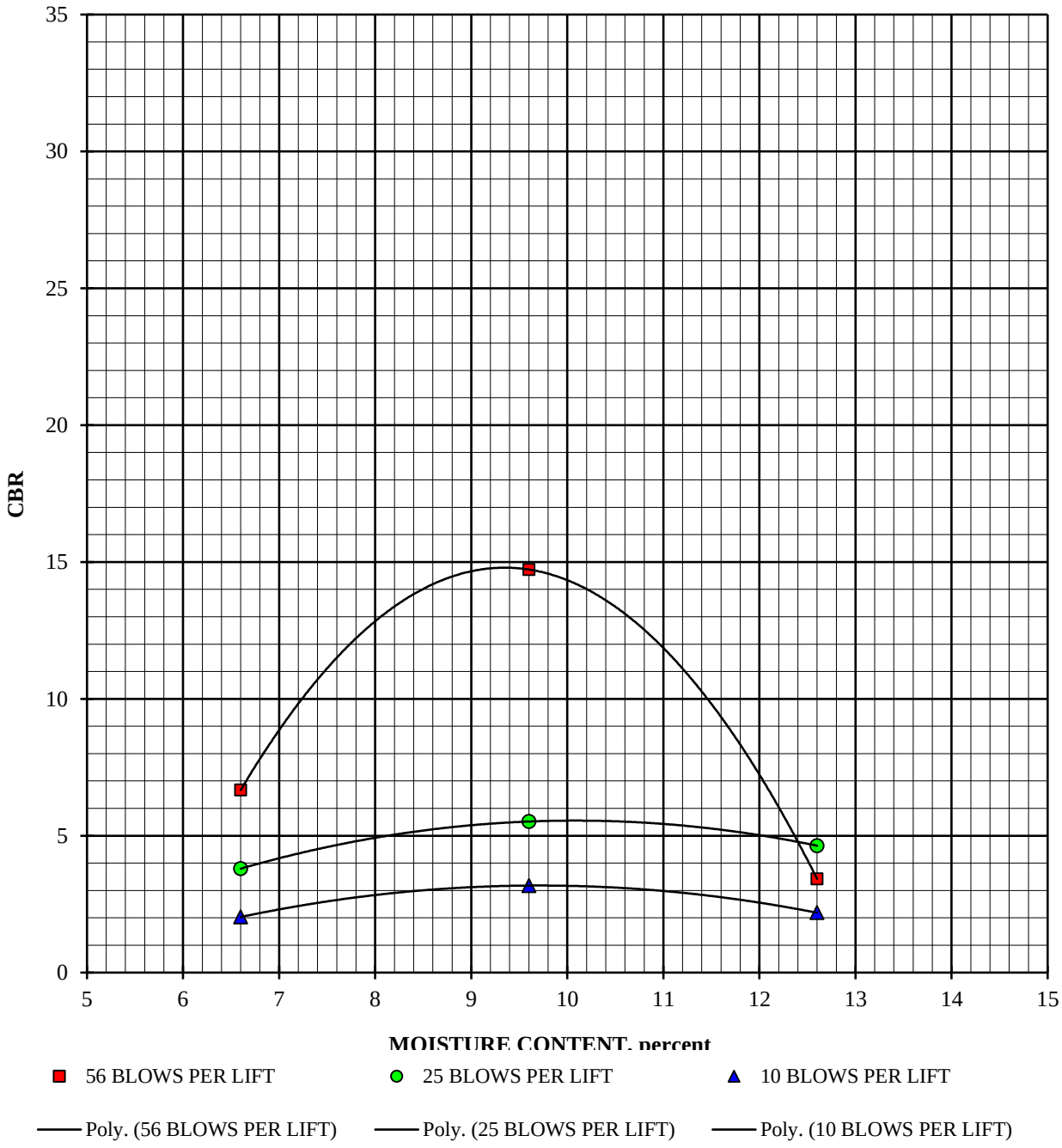
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #14; Boring #39 @ 2.0 - 5.0'

January 8, 2019

Brown Sandy Fat Clay (CH)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

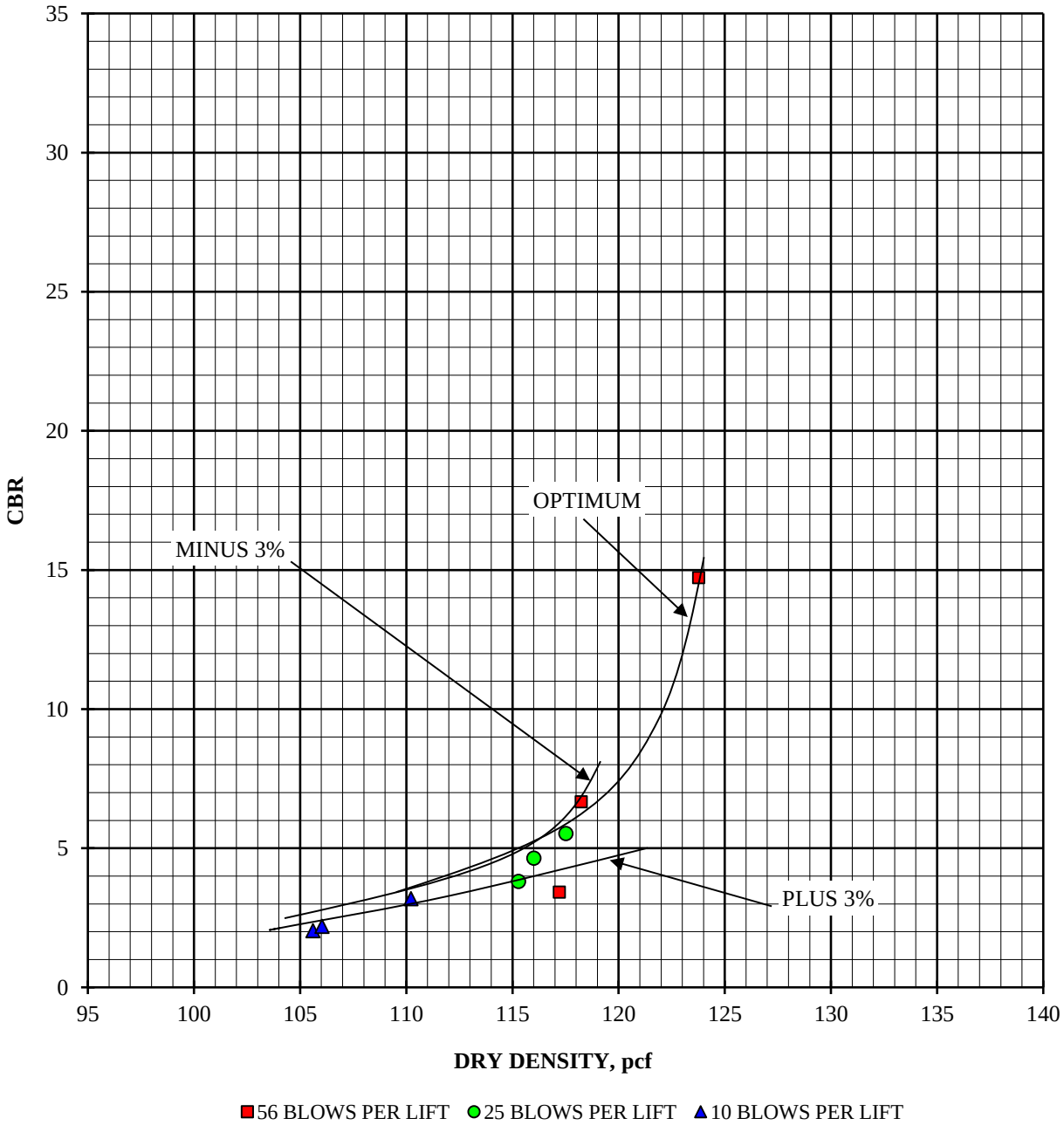
CBR #14; Boring #39 @ 2.0 - 5.0'

January 8, 2019

Brown Sandy Fat Clay (CH)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #15; Boring #17 @ 0.5 - 1.5'
Brown Clayey Sand with Gravel (SC)

January 8, 2019

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	118.7	119.3	119.1
Moisture content, %, before soak	5.0	8.0	11.0
Moisture content, %, after soak, avg.	13.0	12.4	17.2
Moisture content, %, after soak, top 1"	16.7	13.8	13.6
Expansion, %, 96 hour soak	0.0	0.0	0.0
Bearing Ratio, 0.100" penetration	14.2	21.9	13.3

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	119.8	122.4	120.6
Moisture content, %, before soak	5.0	8.0	11.0
Moisture content, %, after soak, avg.	14.8	13.7	17.8
Moisture content, %, after soak, top 1"	14.2	13.1	12.8
Expansion, %, 96 hour soak	0.2	0.1	0.2
Bearing Ratio, 0.100" penetration	15.8	61.2	24.7

56 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	125.3	129.2	128.1
Moisture content, %, before soak	5.0	8.0	11.0
Moisture content, %, after soak, avg.	5.6	9.3	19.9
Moisture content, %, after soak, top 1"	16.3	14.4	13.6
Expansion, %, 96 hour soak	0.2	0.1	0.0
Bearing Ratio, 0.100" penetration	20.8	81.7	61.2

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

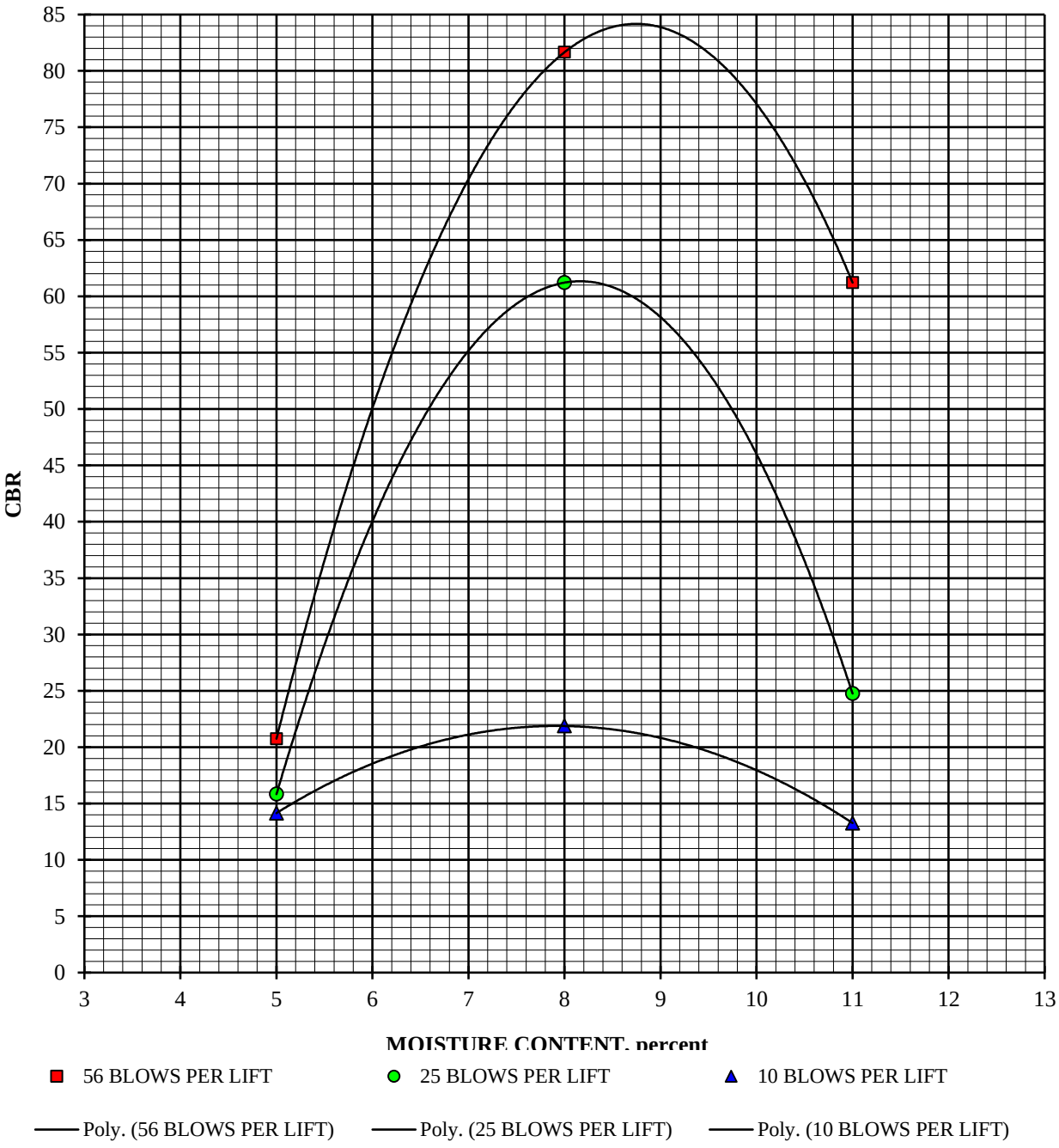
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #15; Boring #17 @ 0.5 - 1.5'

January 8, 2019

Brown Clayey Sand with Gravel (SC)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

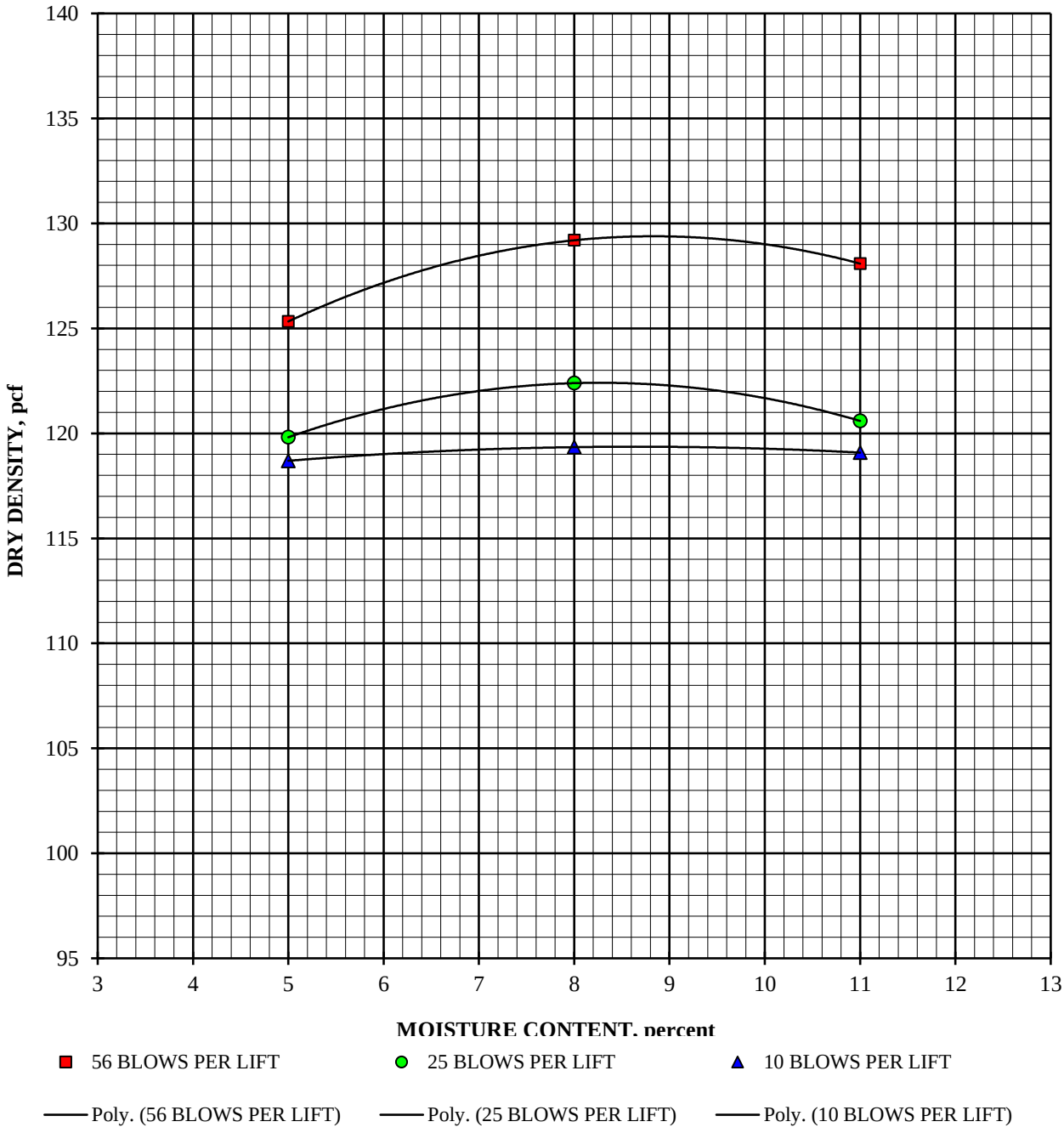
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #15; Boring #17 @ 0.5 - 1.5'

January 8, 2019

Brown Clayey Sand with Gravel (SC)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

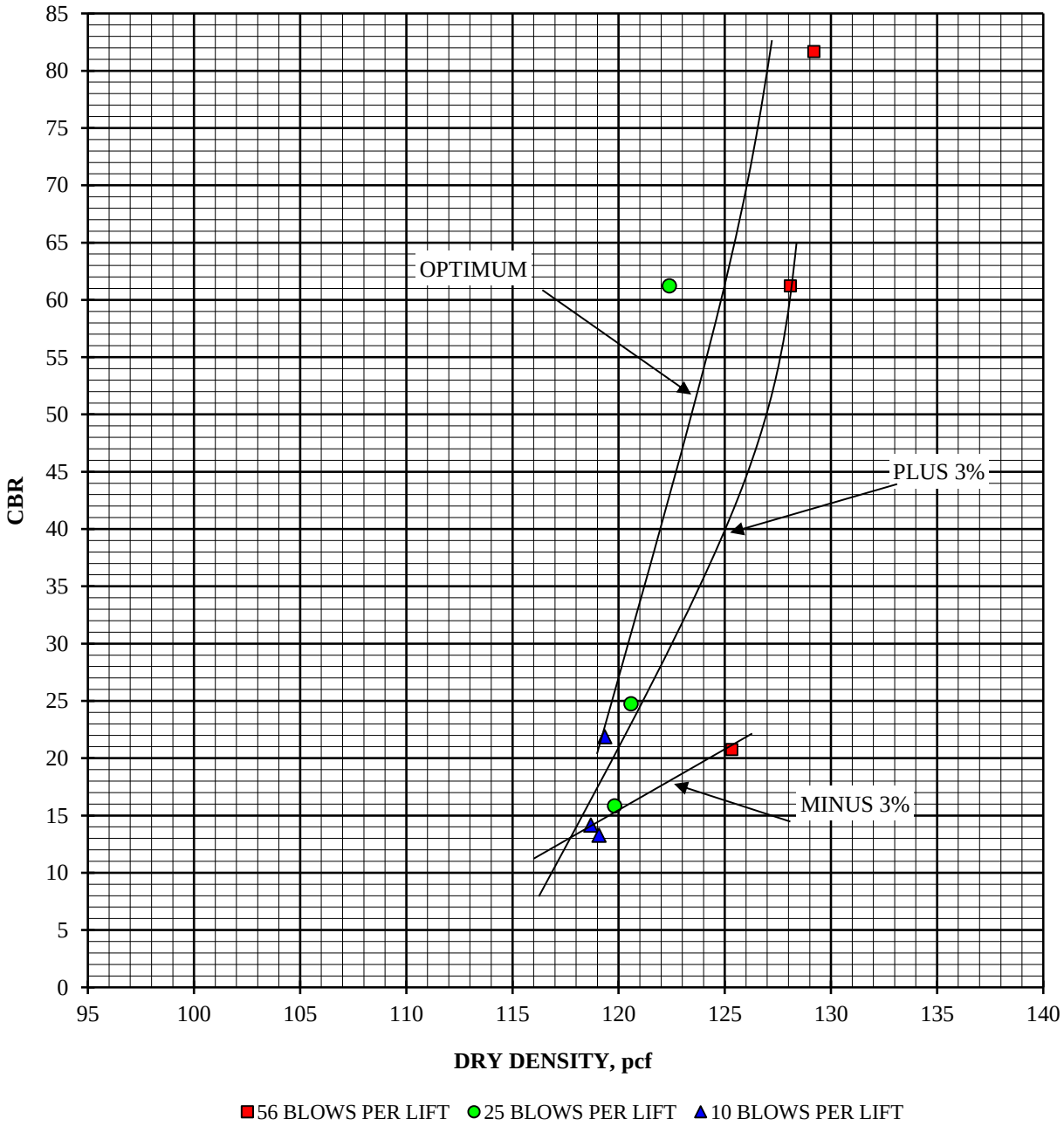
CBR #15; Boring #17 @ 0.5 - 1.5'

January 8, 2019

Brown Clayey Sand with Gravel (SC)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #16; Boring #28 @ 0.5 - 1.5'
Brown Silty Gravel with Sand (GM)

January 8, 2019

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	118.8	121.8	112.9
Moisture content, %, before soak	3.5	6.5	9.5
Moisture content, %, after soak, avg.	8.2	8.9	20.8
Moisture content, %, after soak, top 1"	9.6	9.3	9.0
Expansion, %, 96 hour soak	0.0	0.0	0.0
Bearing Ratio, 0.100" penetration	6.9	24.9	14.9

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	119.0	124.4	113.7
Moisture content, %, before soak	3.5	6.5	9.5
Moisture content, %, after soak, avg.	8.7	8.1	11.4
Moisture content, %, after soak, top 1"	9.8	8.0	8.7
Expansion, %, 96 hour soak	0.0	0.0	0.0
Bearing Ratio, 0.100" penetration	17.7	48.5	23.0

56 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	128.6	130.6	115.3
Moisture content, %, before soak	3.5	6.5	9.5
Moisture content, %, after soak, avg.	6.4	7.7	9.8
Moisture content, %, after soak, top 1"	9.0	7.1	9.2
Expansion, %, 96 hour soak	0.0	0.0	0.0
Bearing Ratio, 0.100" penetration	41.2	85.5	26.2

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

302524-001

CALIFORNIA BEARING RATIO

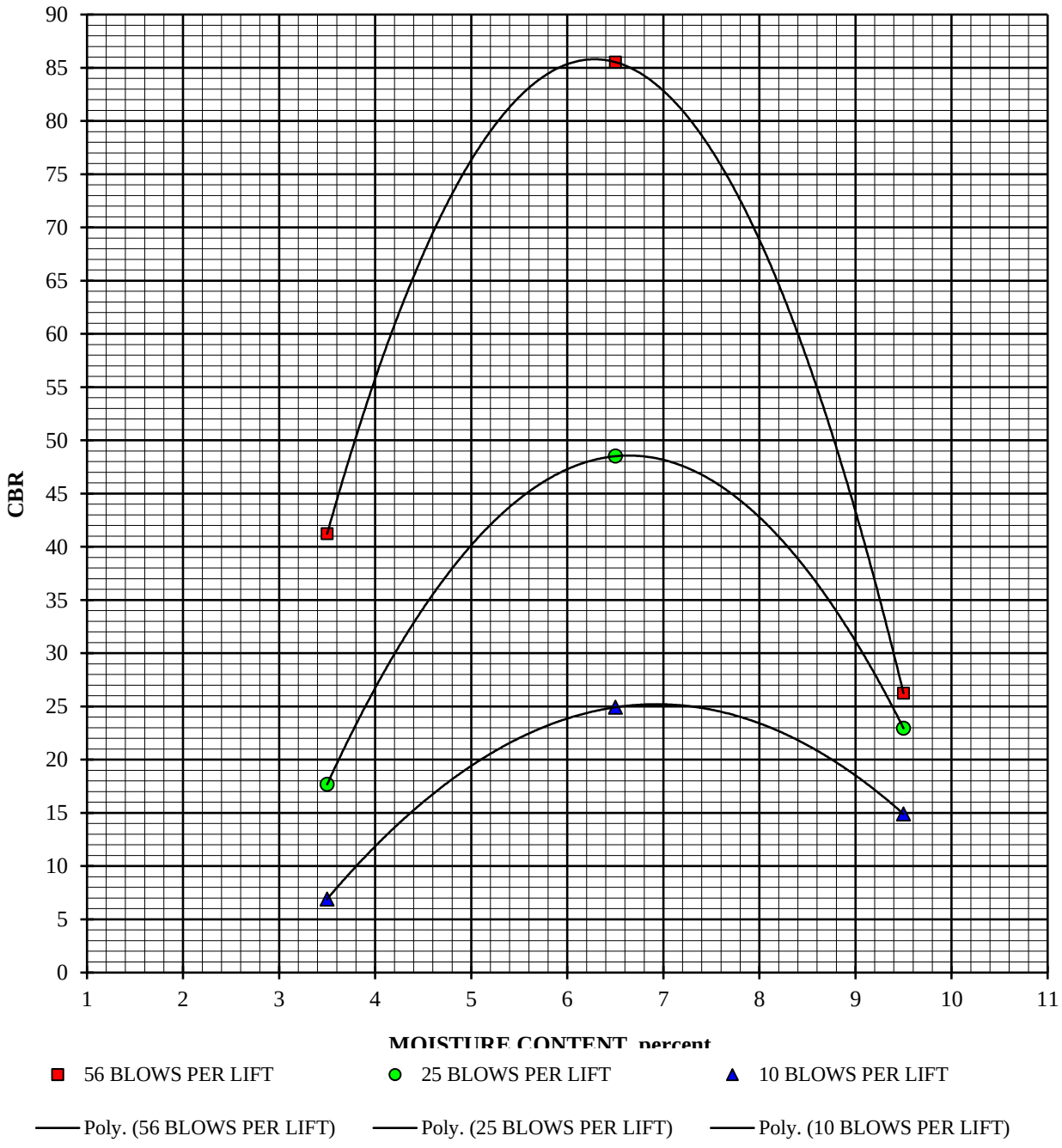
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #16; Boring #28 @ 0.5 - 1.5'

January 8, 2019

Brown Silty Gravel with Sand (GM)

CBR vs. MOISTURE CONTENT



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CALIFORNIA BEARING RATIO

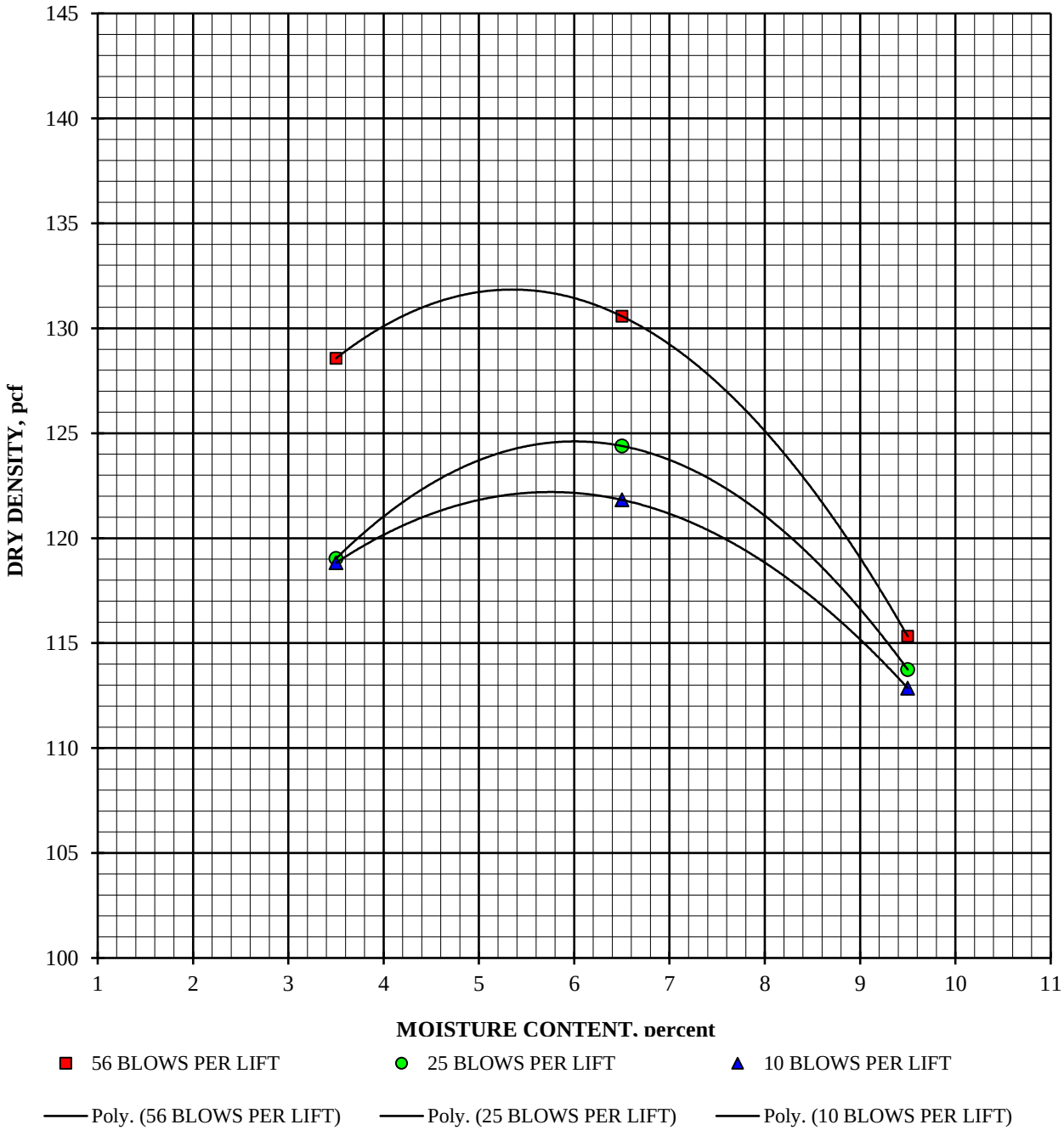
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #16; Boring #28 @ 0.5 - 1.5'

January 8, 2019

Brown Silty Gravel with Sand (GM)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

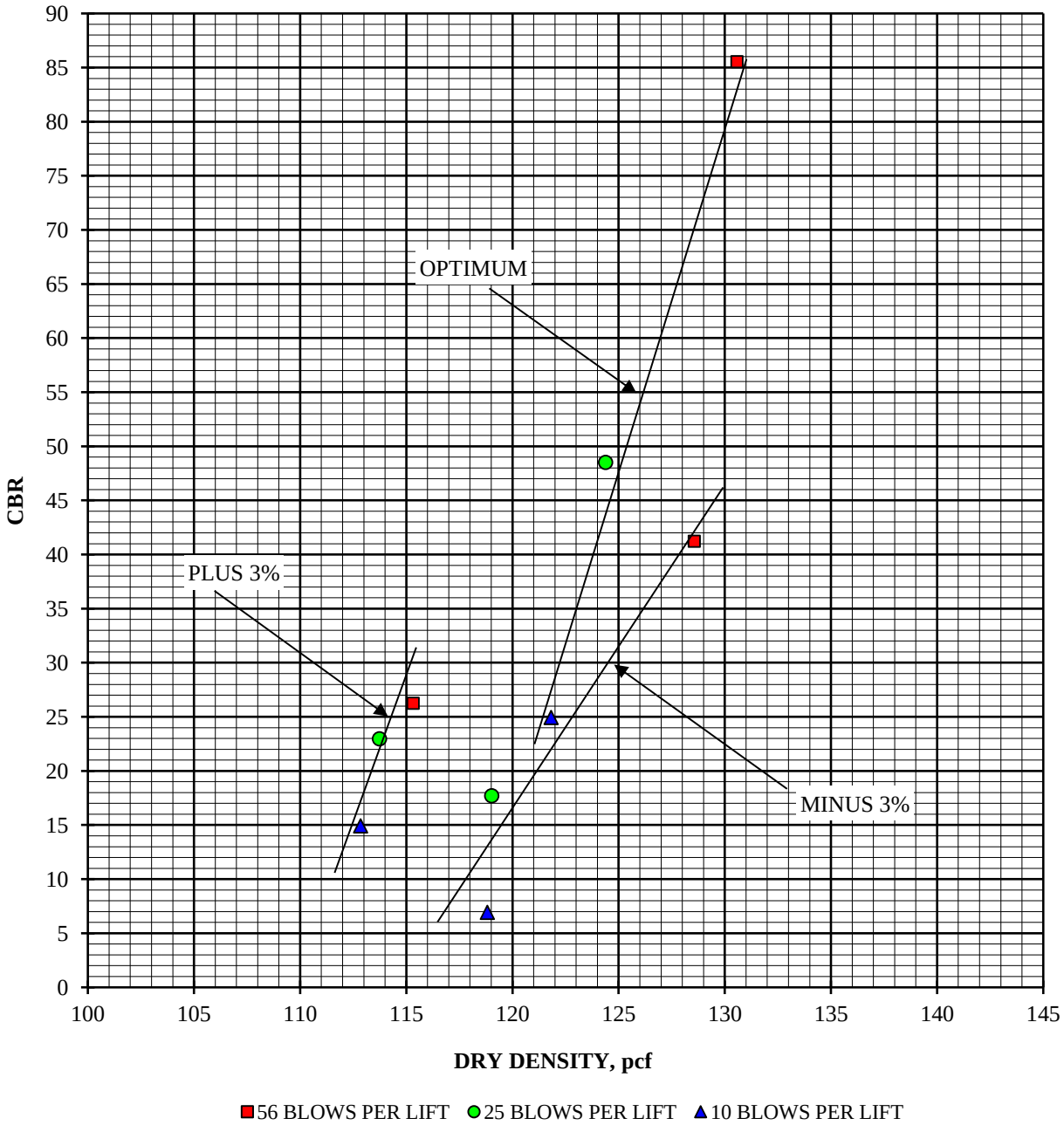
CBR #16; Boring #28 @ 0.5 - 1.5'

January 8, 2019

Brown Silty Gravel with Sand (GM)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #17; Boring #14 @ 0.5 - 1.5'
Brown Silty Sand with Gravel (SM)

January 8, 2019

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	120.4	121.9	114.0
Moisture content, %, before soak	2.8	5.8	8.8
Moisture content, %, after soak, avg.	12.8	9.3	9.5
Moisture content, %, after soak, top 1"	9.7	8.6	8.3
Expansion, %, 96 hour soak	0.0	0.0	0.0
Bearing Ratio, 0.100" penetration	12.2	18.5	14.7

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	121.5	129.2	114.5
Moisture content, %, before soak	2.8	5.8	8.8
Moisture content, %, after soak, avg.	12.2	8.1	10.8
Moisture content, %, after soak, top 1"	9.7	8.9	8.2
Expansion, %, 96 hour soak	0.0	0.0	0.0
Bearing Ratio, 0.100" penetration	12.6	52.9	23.0

56 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	121.9	129.7	116.2
Moisture content, %, before soak	2.8	5.8	8.8
Moisture content, %, after soak, avg.	9.7	8.6	9.4
Moisture content, %, after soak, top 1"	8.7	7.8	7.7
Expansion, %, 96 hour soak	0.0	0.0	0.0
Bearing Ratio, 0.100" penetration	48.4	82.9	19.9

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

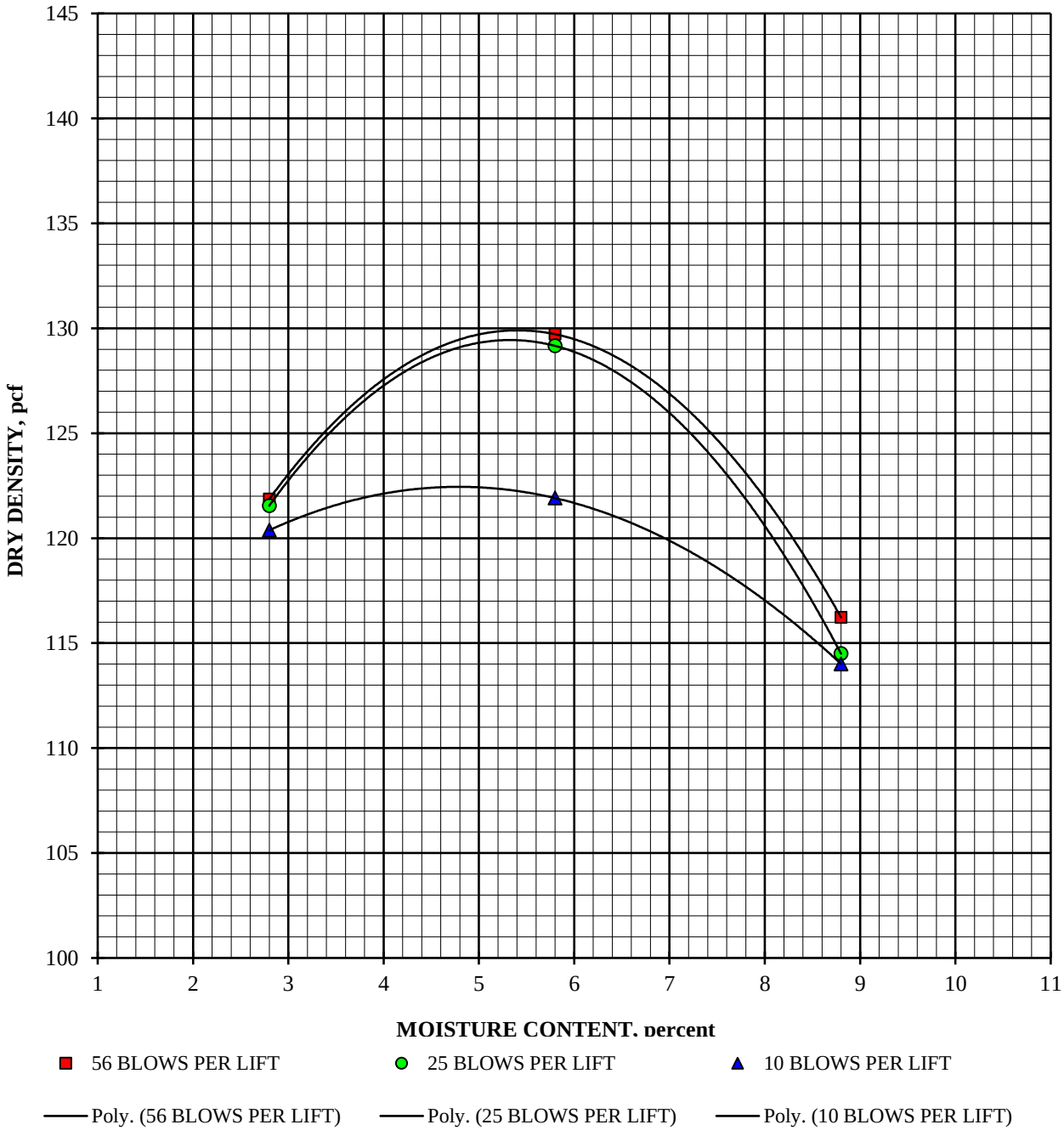
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #17; Boring #14 @ 0.5 - 1.5'

January 8, 2019

Brown Silty Sand with Gravel (SM)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

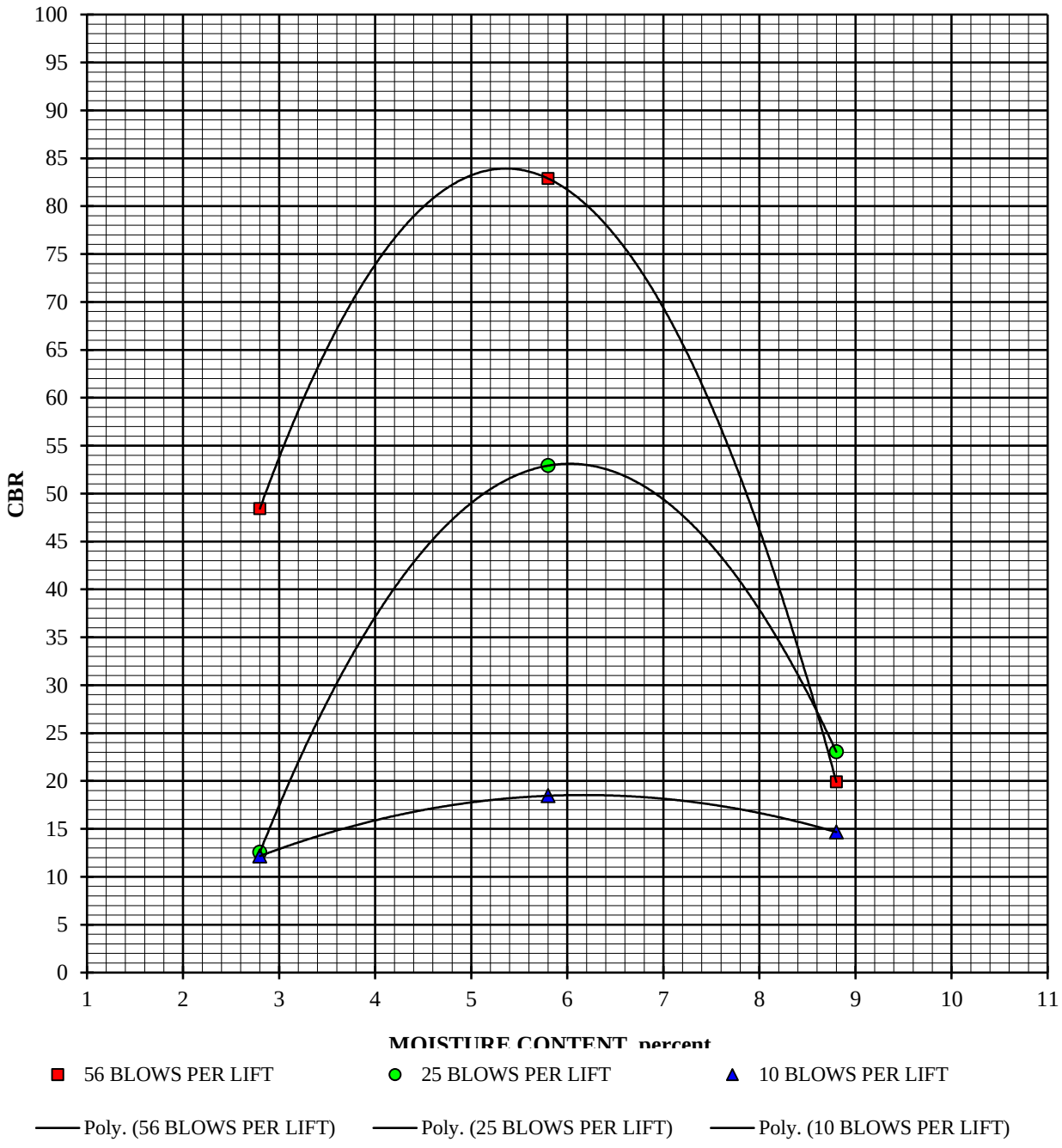
ASTM D 1883-16 (For a Range of Moisture Contents)

CBR #17; Boring #14 @ 0.5 - 1.5'

January 8, 2019

Brown Silty Sand with Gravel (SM)

CBR vs. MOISTURE CONTENT



Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

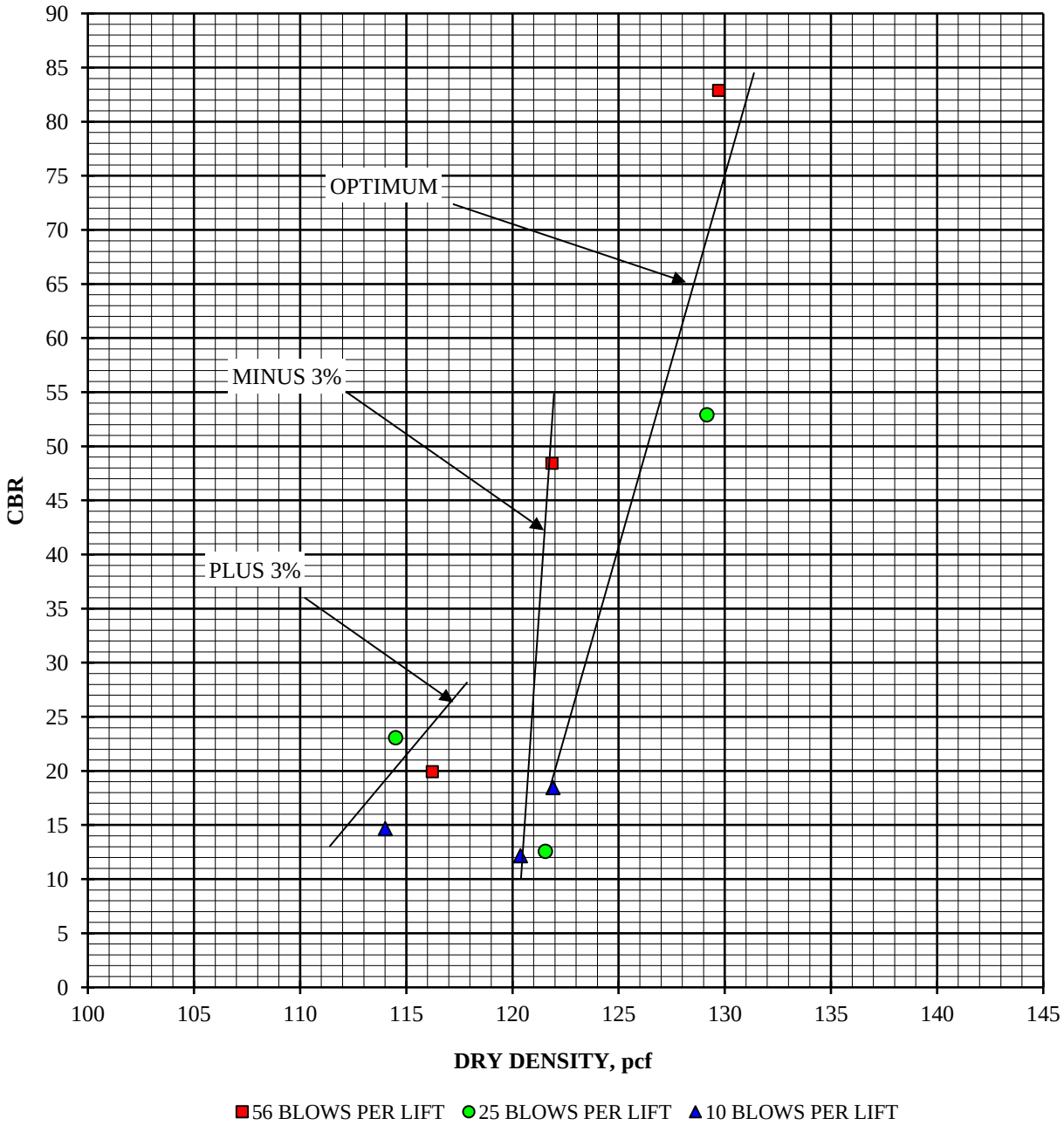
CBR #17; Boring #14 @ 0.5 - 1.5'

January 8, 2019

Brown Silty Sand with Gravel (SM)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



APPENDIX C

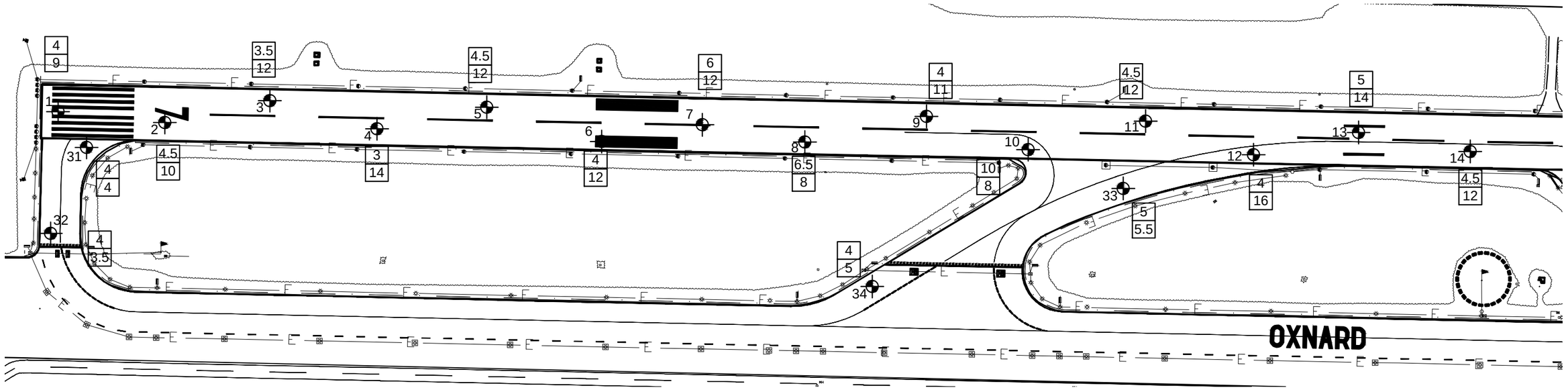
Figures 2a and 2b – Existing Pavement Section Thicknesses

Figures 3a and 3b – USCS Soil Types at Subgrade

Figures 4a and 4b – CBR Values – 95% Minimum Relative Compaction at Subgrade

Figures 5a and 5b – Approximate CBR Values Based on Existing Soil Density and Moisture Content at Subgrade

Figures 6a and 6b – Subgrade Soil Moisture Content



LEGEND

40 Boring Location (Approx.)

4	Asphalt Concrete (AC) - Inches
9	Miscellaneous Aggregate Base (mAB) - Inches

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

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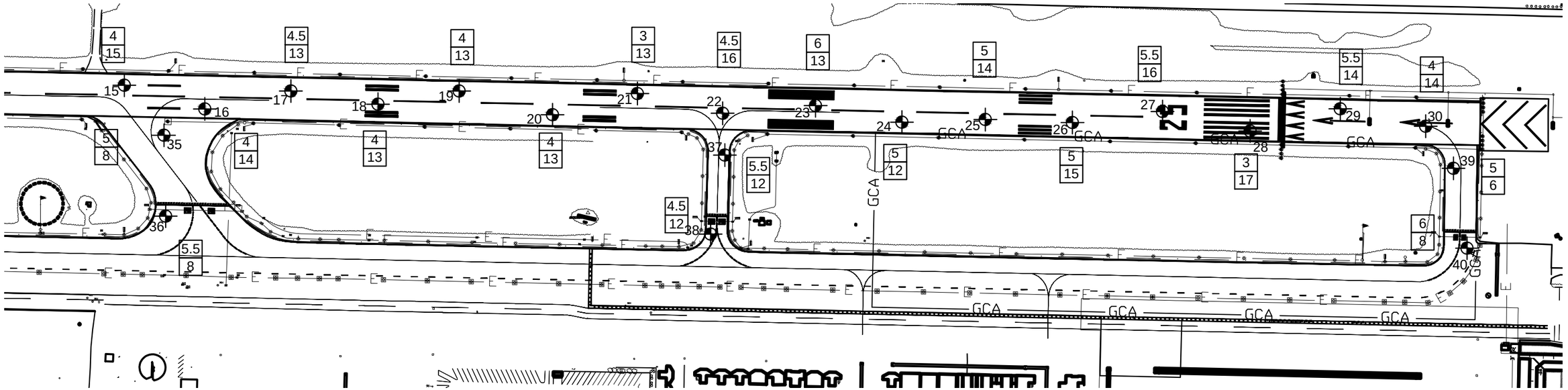
FIGURE 2A - EXISTING PAVEMENT SECTION THICKNESSES

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

Project No.
302524-001



LEGEND

40 Boring Location (Approx.)

4	Asphalt Concrete (AC) - Inches
9	Miscellaneous Aggregate Base (mAB) - Inches

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

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FIGURE 2B - EXISTING PAVEMENT SECTION THICKNESSES

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements
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February 2020

Project No.
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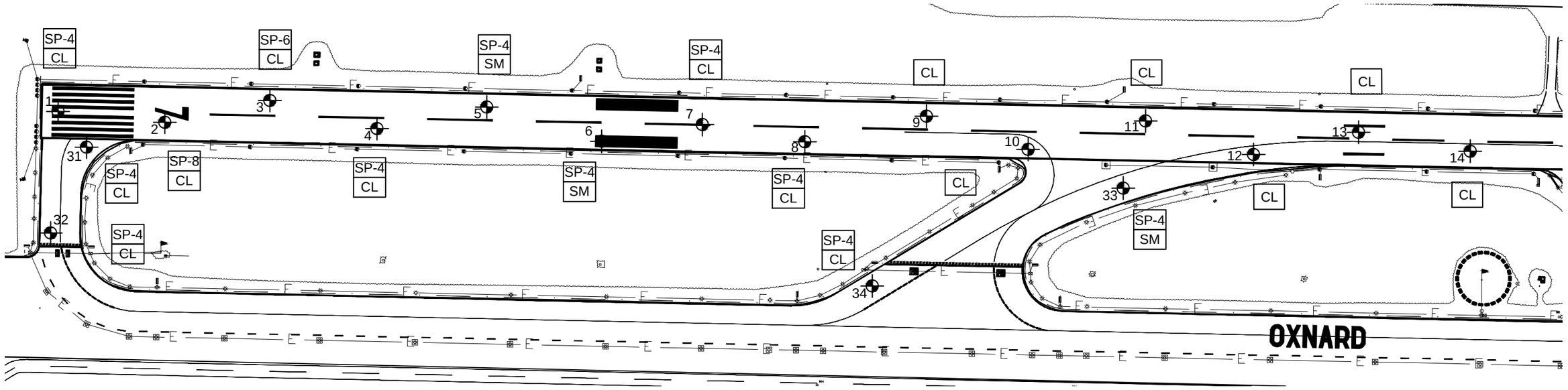

LEGEND

40 Boring Location (Approx.)

SP-X Poorly Graded Sand - "x" indicates thickness in inches where present below pavement section

CL SANDY LEAN CLAY

SM SILTY SAND

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

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FIGURE 3A - USCS SOIL TYPES AT SUBGRADE

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements
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Oxnard, California

Date
February 2020

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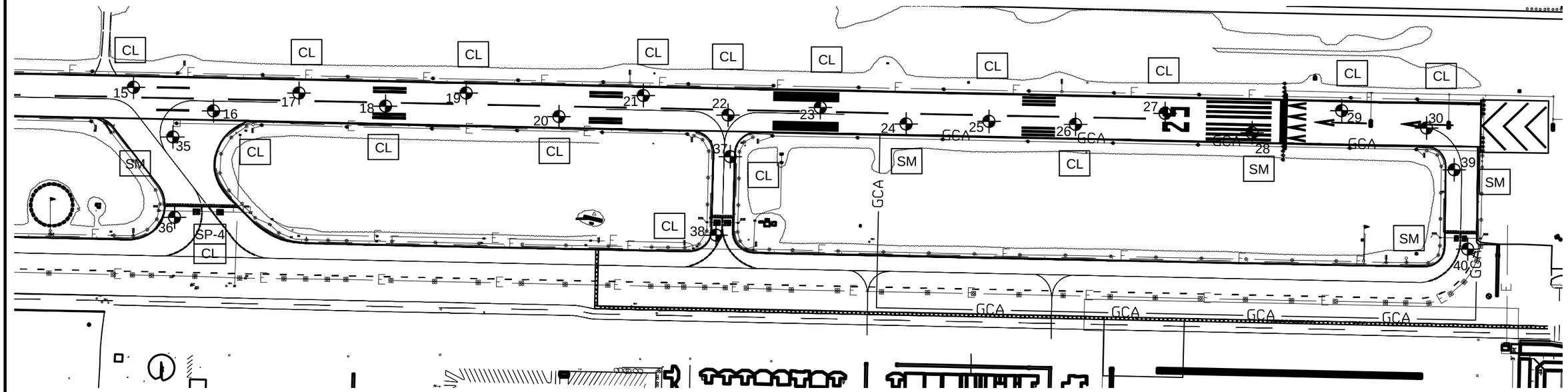

LEGEND

40 Boring Location (Approx.)

SP-X Poorly Graded SAND - "x" indicates thickness in inches where present below pavement section

CL SANDY LEAN CLAY

SM SILTY SAND

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

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FIGURE 3B - USCS SOIL TYPES AT SUBGRADE

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

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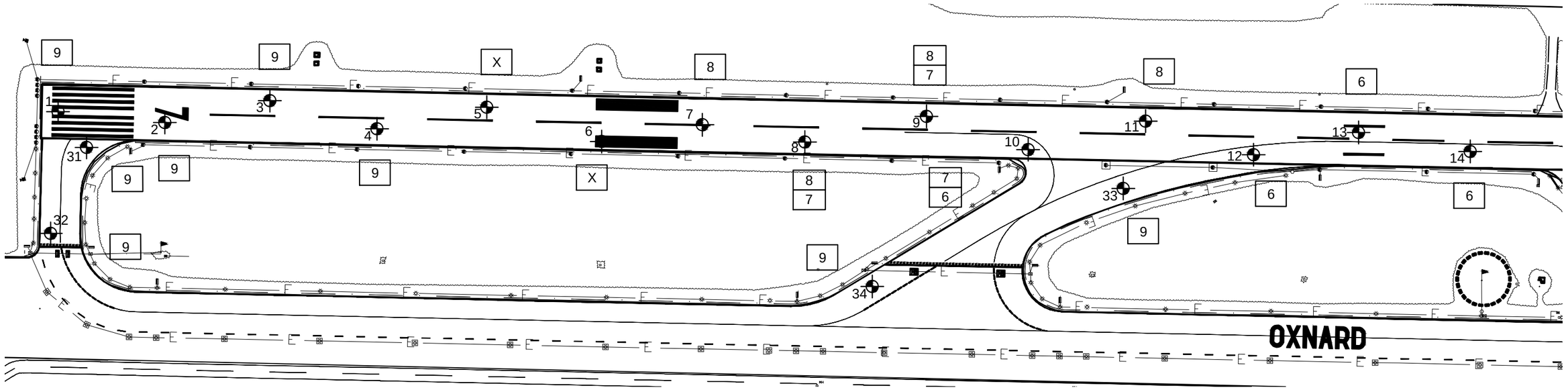

LEGEND

40 Boring Location (Approx.)

X — Subgrade soil from this boring lime treated at 3,5 and 7 percent by dry weight - See report text

9 — Recommended soil CBR value for reconstructed areas with subgrade compacted to a minimum of 95 percent relative compaction and soil moisture content in range of optimum +/- 2 percent. Thin (+/- 4 to 8 inch) poorly graded sand layers, where present, disregarded

8 / 7 — Upper Soil Layer 18 inches thick or less, CBR value possibly affected by underlying soil layer (Assumes underlying layer also compacted to 95 percent relative compaction at soil moisture content of optimum +/- 2 percent)

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

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FIGURE 4A - CBR VALUES - 95% MINIMUM RELATIVE COMPACTION AT SUBGRADE

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements
2889 West 5th Street
Oxnard, California

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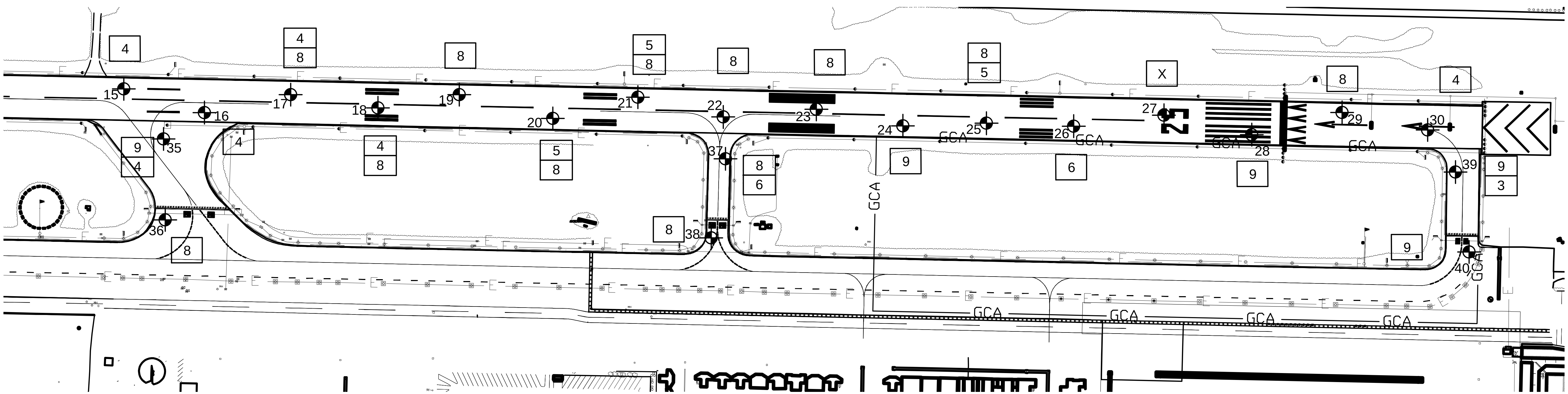

LEGEND

40 ⊕ Boring Location (Approx.)

X — Subgrade soil from this boring lime treated at 3,5 and 7 percent by dry weight - See report text

9 — Recommended soil CBR value for reconstructed areas with subgrade compacted to a minimum of 95 percent relative compaction and soil moisture content in range of optimum +/- 2 percent. Thin (+/- 4 to 8 inch) poorly graded sand layers, where present, disregarded

8 / 7 — Upper Soil Layer 18 inches thick or less, CBR value possibly affected by underlying soil layer (Assumes underlying layer also compacted to 95 percent relative compaction at soil moisture content of optimum +/- 2 percent)

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

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FIGURE 4B - CBR VALUES - 95% MINIMUM RELATIVE COMPACTION AT SUBGRADE

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements
2889 West 5th Street
Oxnard, California

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February 2020

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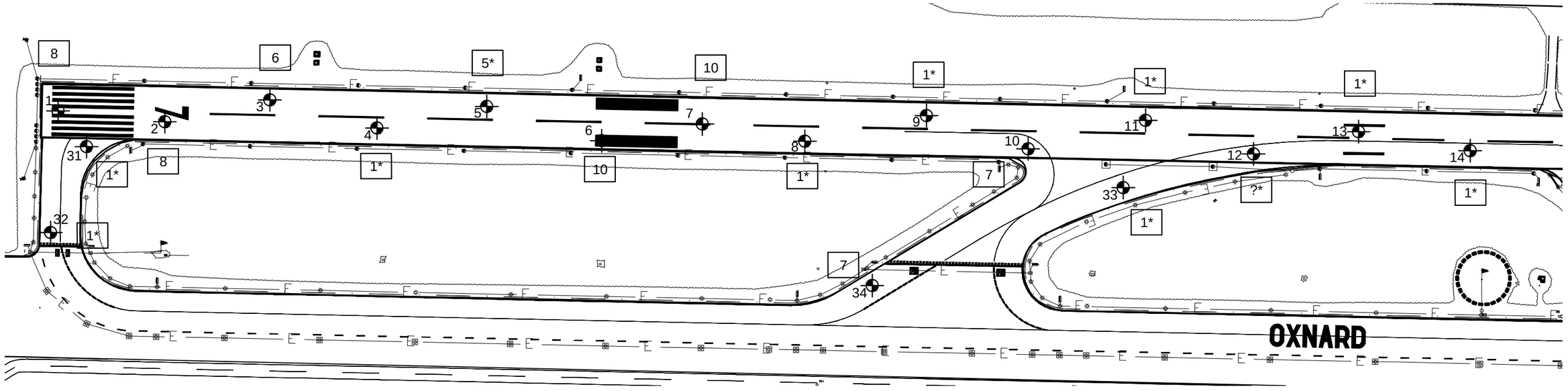
Sheet 2 of 2



LEGEND

40 Boring Location (Approx.)

8 Approximate CBR based on existing soil density and moisture content at subgrade. Thin (+/- 4 to 8 inch) poorly graded sand layers, where present, disregarded

1* Asterisk indicates soil density and/or moisture content beyond laboratory data range - CBR value estimated only. Question mark (?) indicates no estimate possible from laboratory data.

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

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FIGURE 5A - APPROXIMATE CBR VALUES BASED ON EXISTING SOIL DENSITY AND MOISTURE CONTENT AT SUBGRADE

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

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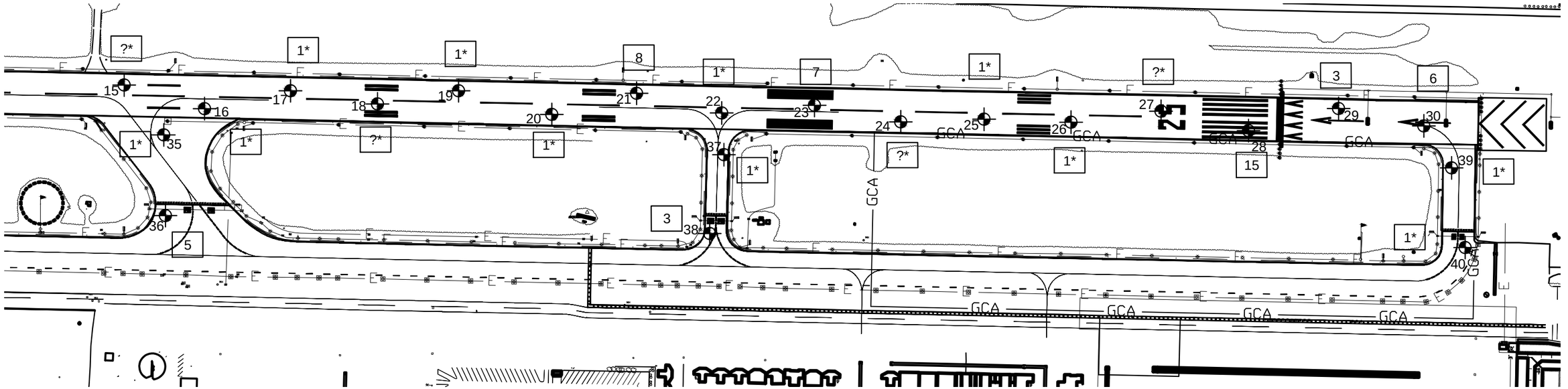

LEGEND

40 Boring Location (Approx.)

8 Approximate CBR based on existing soil density and moisture content at subgrade. Thin (+/- 4 to 8 inch) poorly graded sand layers, where present, disregarded

1* Asterisk indicates soil density and/or moisture content beyond laboratory data range - CBR value estimated only. Question mark (?) indicates no estimate possible from laboratory data.

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

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FIGURE 5B - APPROXIMATE CBR VALUES BASED ON EXISTING SOIL DENSITY AND MOISTURE CONTENT AT SUBGRADE

Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements
2889 West 5th Street
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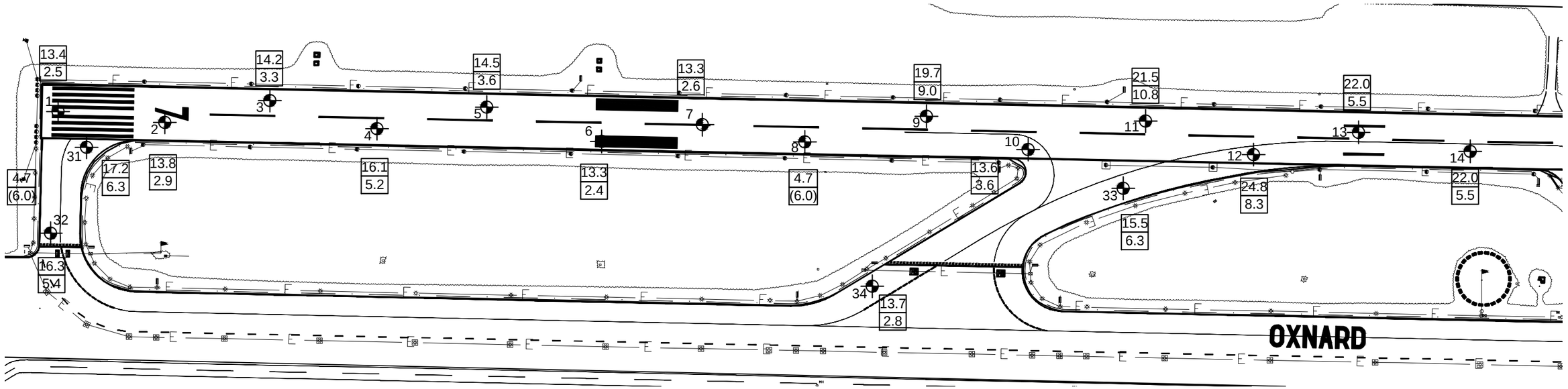

LEGEND

40 Boring Location (Approx.)

4.7 Subgrade soil moisture content at time of drilling, percent
(6.0) Percent above (below) optimum moisture content

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FIGURE 6A - SUBGRADE SOIL MOISTURE CONTENT

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2889 West 5th Street
Oxnard, California

Date
February 2020

Project No.
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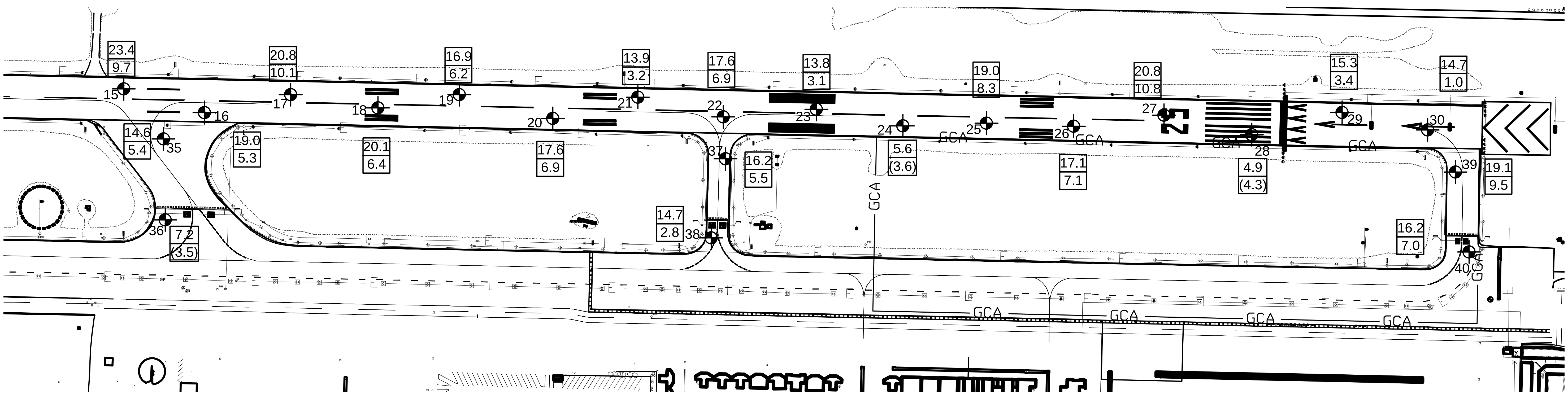

LEGEND

40 — Boring Location (Approx.)

4.7	Subgrade soil moisture content at time of drilling , percent
(6.0)	Percent above (below) optimum moisture content

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

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FIGURE 6B - SUBGRADE SOIL MOISTURE CONTENT
Oxnard Airport - Runway 7-25 and Taxiway Connector Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

Project No.
302524-001

Sheet 2 of 2

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APPENDIX D

Estimates of Earthwork Shrinkage

OXNARD AIRPORT **ESP File No. 302524-001**
RUNWAY 7-25 AND TAXIWAY CONNECTOR IMPROVEMENTS
0

Estimates of Soil Shrinkage Using In-Place Density Values from Borings and Assumed Final Relative Compaction Values. All Calculations Based on Uniform Density, Moisture Content and Compaction Effort Negative Values Indicate Expansion (Bulking).

CBR No.	Boring No.	Depth	Material Description	USCS Classification	Maximum Density, pcf	Optimum Moisture, %
1	1	2.0 - 2.5 ft.	Dark Brown Sandy Lean Clay	CL	123.5	10.9
5	36	2.0 - 5.0 ft.	Dark Brown Sandy Lean Clay	CL	121.5	10.7
7	23	3.5 - 5.0 ft	Brown Lean Clay	CL	121.6	10.9
8	29	2.0 - 5.0 ft.	Brown/Gray Mottled Sandy Lean Clay	CL	123.1	11.9
11	16	2.0 - 4.0 ft	Dark Brown Sandy Lean Clay	CL	114.7	13.7
12	13	2.0 - 4.0 ft.	Dark Brown Sandy Lean Clay	CL	112.2	16.5
13	40	1.5 - 3.5 ft.	Brown Silty Sand	SM	126.5	9.2
14	39	2.0 - 5.0 ft.	Brown Sandy Fat Clay	CH	120.4	9.6

Boring	Depth, Ft. Below Ext. Grade	Moisture in Place, %	Dry Density in Place, pcf	Maximum Dens., pcf	Existing Rel.Comp. %	Shrinkage, % at 95.0 % Rel. Comp.	Shrinkage, % at 96.0 % Rel. Comp.	Shrinkage, % at 97.0 % Rel. Comp.	Shrinkage, % at 98.0 % Rel. Comp.	Shrinkage, % at 99.0 % Rel. Comp.	Shrinkage, % at 100.0 % Rel. Comp.
1	2-2.5	13.4	119.4	123.5	96.7	-1.7	-0.7	0.3	1.4	2.4	3.4
2	2.5-3	13.8	121.1	123.5	98.1	-3.1	-2.1	-1.1	-0.1	1.0	2.0
3	2.5-3	14.2	116.9	123.5	94.7	0.4	1.4	2.5	3.5	4.6	5.6
4	2.5-3	16.1	116.2	123.5	94.1	1.0	2.0	3.1	4.2	5.2	6.3
5	2.5-3	14.5	118.3	123.5	95.8	-0.8	0.2	1.3	2.3	3.4	4.4
6	2.5-3	13.3	121.5	123.5	98.4	-3.4	-2.4	-1.4	-0.4	0.6	1.6
7	2-2.5	13.3	121.9	121.5	100.3	-5.3	-4.3	-3.3	-2.3	-1.3	-0.3
8	2-2.5	4.7	118.1	121.5	97.2	-2.3	-1.2	-0.2	0.8	1.9	2.9
9	2.5-3	19.7	102.6	121.5	84.4	12.5	13.7	14.9	16.1	17.2	18.4
10	2.5-3	13.6	115.0	122.5	93.9	1.2	2.3	3.3	4.4	5.5	6.5
11	2.5-3	21.5	104.0	121.5	85.6	11.0	12.2	13.3	14.5	15.7	16.8
12	2.5-3	24.8	95.5	112.2	85.1	11.6	12.8	14.0	15.1	16.3	17.5
13	2.5-3	22.0	101.2	112.2	90.2	5.3	6.4	7.5	8.7	9.8	10.9
14	2.5-3	22.0	102.5	112.2	91.4	4.0	5.1	6.2	7.3	8.4	9.5
15	2.5-3	23.4	100.1	114.7	87.3	8.9	10.0	11.1	12.3	13.4	14.6
16	2.5-3	19.0	109.3	114.7	95.3	-0.3	0.7	1.8	2.8	3.9	4.9
17	2.5-3	20.8	104.8	121.5	86.3	10.1	11.3	12.5	13.6	14.8	15.9
18	2.5-3	20.1	103.2	114.7	90.0	5.6	6.7	7.8	8.9	10.0	11.1
19	2.5-3	16.9	113.4	121.5	93.3	1.8	2.9	3.9	5.0	6.1	7.1
20	2.5-3	17.6	111.7	121.5	91.9	3.3	4.4	5.5	6.6	7.7	8.8
21	2-2.5	13.9	119.5	121.5	98.4	-3.4	-2.4	-1.4	-0.4	0.7	1.7
22	3-3.5	17.6	114.0	121.5	93.8	1.3	2.3	3.4	4.4	5.5	6.6
23	2.5-3	13.8	118.5	121.5	97.5	-2.6	-1.6	-0.5	0.5	1.5	2.5
24	2.5-3	5.6	107.2	126.5	84.7	12.1	13.3	14.5	15.6	16.8	18.0
25	2.5-3	19.0	106.3	121.5	87.5	8.6	9.7	10.9	12.0	13.2	14.3
26	3-3.5	17.1	110.1	122.5	89.9	5.7	6.8	7.9	9.0	10.1	11.3
27	3-3.5	20.8	97.4	122.5	79.5	19.5	20.7	22.0	23.3	24.5	25.8
28	2.5-3	4.9	122.5	126.5	96.8	-1.9	-0.9	0.2	1.2	2.2	3.3
29	2.5-3	15.3	112.5	123.1	91.4	4.0	5.0	6.1	7.2	8.3	9.4
30	2.5-3	14.7	112.2	114.7	97.8	-2.9	-1.9	-0.8	0.2	1.2	2.2
31	2.5-3	17.2	110.6	123.5	89.6	6.1	7.2	8.3	9.4	10.5	11.7
32	2-2.5	16.3	110.8	123.5	89.7	5.9	7.0	8.1	9.2	10.3	11.5
33	2-2.5	15.5	115.3	126.5	91.1	4.2	5.3	6.4	7.5	8.6	9.7
34	2-2.5	13.7	118.4	123.5	95.9	-0.9	0.1	1.2	2.2	3.3	4.3
35	2-2.5	14.6	117.0	126.5	92.5	2.7	3.8	4.9	6.0	7.0	8.1
36	2-2.5	7.2	114.7	121.5	94.4	0.6	1.7	2.8	3.8	4.9	5.9
37	2.5-3	16.2	110.1	121.5	90.6	4.8	5.9	7.0	8.1	9.3	10.4
38	2.5-3	14.7	110.9	123.1	90.1	5.5	6.6	7.7	8.8	9.9	11.0
39	2-2.5	19.1	108.4	120.4	90.0	5.5	6.6	7.7	8.8	10.0	11.1
40	2.5-3	16.2	117.1	126.5	92.6	2.6	3.7	4.8	5.9	6.9	8.0
			Average Shrinkage, percent, all locations :			**3.4**	**4.5**	**5.6**	**6.7**	**7.8**	**8.9**
						At 95.0 % Rel. Comp.	**At 96.0 % Rel. Comp.**	**At 97.0 % Rel. Comp.**	**At 98.0 % Rel. Comp.**	**At 99.0 % Rel. Comp.**	**At 100.0 % Rel. Comp.**

GEOTECHNICAL ENGINEERING REPORT
OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 WEST 5TH STREET
OXNARD, CALIFORNIA
MEAD & HUNT, INC. PROJECT NO. 3138400-181115.03

July 10, 2020

Prepared for

Mr. Jeff Leonard, PE
Associate Practice Leader
Aviation Services
Mead & Hunt, Inc.

Prepared by

Earth Systems Pacific
4378 Old Santa Fe Road
San Luis Obispo, CA 93401

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Earth Systems
4378 Old Santa Fe Road | San Luis Obispo, CA 93401 | Ph: 805.544.3276 | www.earthsystems.com

July 10, 2020

FILE NO.: 302524-002

Mr. Jeff Leonard, PE
Vice President
Mead & Hunt, Inc.
1360 19th Hole Drive, Suite 200
Windsor, CA 95492-7717

PROJECT: OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 WEST 5TH STREET
OXNARD, CALIFORNIA
MEAD & HUNT, INC. PROJECT NO. 3138400-181115.03

SUBJECT: Geotechnical Engineering Report

CONTRACT REFERENCE: Service Work Order No. 1, Oxnard Taxiway F, by Mead & Hunt, Inc., Referencing Proposal to Provide a Geotechnical Engineering Investigation and Recommendations, Oxnard Airport, Taxiway F Reconstruction, Oxnard, California, by Earth Systems Pacific, Doc. No. 1909-021.PRP, dated September 5, 2019

Dear Mr. Leonard:

As per the referenced Service Work Order, this geotechnical engineering report has been prepared for use in the design of the Taxiway F Improvements Project at Oxnard Airport in Oxnard, California. Boring logs and a boring location map, results of laboratory testing, and conclusions regarding CBR testing, earthwork shrinkage, and subsurface water and soil moisture contents are provided. This final report version incorporates responses to comments received from the client on a draft version issued on February 21, 2020.

We appreciate the opportunity to have provided geotechnical services for this project and look forward to working with you again in the future. If there are any questions concerning this report, please do not hesitate to contact the undersigned.

Sincerely,

Earth Systems Pacific

REGISTERED PROFESSIONAL ENGINEER FREDERICK J. POTTHAST No. GE 2369 Exp. 03/31/22 GEOTECHNICAL STATE OF CALIFORNIA

Fred J. Potthast, GE
Principal Engineer

Copy to: Mead & Hunt, Inc., Attn.: Edoardo Barber, and Jannet Loera

Doc. No.: 2007-040.SER/cr

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APPENDICES

1.0 INTRODUCTION

This geotechnical engineering report has been completed for the client's use in the development of a preliminary pavement design for Taxiway F at Oxnard Airport in Oxnard, California. Previous investigations of the pavement on the Airport were provided by this firm (ESP 2015 and 2020) and by Miller Geosciences, Inc. (Miller 2014). Based on those reports, the existing pavement sections are known to consist of varying thicknesses of asphalt concrete (AC) over varying thicknesses of aggregate base (AB). Taxiway F is currently in regular use.

In general, this report contains logs of the subsurface conditions encountered in our exploratory borings, the results of laboratory tests, and conclusions regarding CBR testing, earthwork shrinkage, and subsurface water and soil moisture contents. We understand that this report, and the previous investigations, will be used by the client and the owner to determine if rehabilitation or reconstruction of Taxiway F will be necessary.

2.0 SCOPE OF SERVICES

The scope of work for this geotechnical engineering report included a general site reconnaissance, subsurface exploration, laboratory testing of soil samples, engineering evaluation of the data collected, and the preparation of this report. The investigation and subsequent recommendations were based on information and base maps provided by the client.

The report and recommendations are intended to be in general accordance with AC 150/5320-6F (FAA 2016), the client's requested work scope, and common geotechnical engineering practice in this area under similar conditions at this time. The tests were performed in general conformance with the standards noted, as modified by common geotechnical engineering practice in this area under similar conditions at this time.

It is our intent that this report be used exclusively by the client to determine if rehabilitation or reconstruction of the taxiway will be necessary. The information may also be used to develop plans for future projects; however, no other specific projects are planned at this time. Application beyond these intents is strictly at the user's risk. As there may be geotechnical issues yet to be resolved, the geotechnical engineer should be retained to provide consultation as the project progresses, to assist in verifying that pertinent geotechnical issues have been addressed and to aid in conformance with the intent of this report. In the event this report is used to develop project plans, it may also be advantageous to retain the geotechnical engineer to review the grading and drainage plans as they near completion to further aid in conformance of the plans with the intent of this report.

This report does not address issues in the domain of the contractor such as, but not limited to, site safety, excavatability, shoring, temporary slope angles, construction methods, etc. Analysis of site geology and of the soil for corrosive potential, radioisotopes, asbestos (either naturally occurring or in man-made products), lead or mold potential, hydrocarbons, or other chemical properties are beyond the scope of this investigation. Ancillary features beyond the pavement areas covered by this report are also not within our scope and are not addressed.

In the event that there are any changes in the nature of the work scope, or if any assumptions used in the preparation of this report prove to be incorrect, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing.

3.0 FIELD INVESTIGATION

On October 8 through October 11, 2019, a total of 30 borings were drilled on Taxiway F during night-shift closure periods. The borings were designated as Nos. 41 through 70, continuing the sequence started for the Runway 7-25 and Taxiway Connector Improvements Project Geotechnical Engineering Report by this firm (ESP 2020). The borings were extended to a maximum depth of 10.0 feet below the existing pavement surfaces with a Mobile Drill rig, Model B-53, equipped with 6-inch outside diameter hollow stem auger and an automatic hammer for sampling. The approximate locations of the borings are shown on the Exploration Location Maps – Figures 1A and 1B, in Appendix A.

The boring locations, which were provided to us on a base map by the client, were identified and marked in the field during a site visit with airport staff on September 27, 2019. During the field meeting, the general areas of all requested boring locations were determined by airport staff to be clear of underground utility lines, with only slight adjustments in a few locations made to increase setback distances.

As the borings were drilled, soil samples were obtained using a 3-inch outside diameter ring-lined barrel sampler (ASTM D 3550-17 with shoe similar to D 2937-17) at approximate subgrade elevation. Standard penetration tests (SPT) using a 2-inch outside diameter split-spoon sampler were also performed in the borings (ASTM D 1586-11) from 5 to 6.5 feet and from 8.5 to 10.0 feet in each boring. Bulk samples were secured from the auger cuttings.

The pavement sections at each boring location were noted by direct measurement of the material layers in the boring. The soils underlying the pavement sections were initially classified

and logged in general accordance with the Unified Soils Classification System (ASTM D 2488-17). Final classifications of the soils in accordance with the Unified Soils Classification System (ASTM D 2487-17) were made following completion of laboratory testing. Copies of the boring logs and a boring log legend can also be found in Appendix A. In reviewing the boring logs and legend, the reader should recognize that the legend is intended as a guideline only, and there are a number of conditions that may influence the soil characteristics as observed during drilling. These include, but are not limited to, cementation, variations in soil moisture, presence of groundwater, and other factors. Consequently, the logger must exercise judgment in interpreting soil characteristics, possibly resulting in soils descriptions that vary somewhat from the legend. Following completion of drilling, the borings were backfilled with cement-treated auger spoils and gravel, and then patched at the surface with cold-mix AC (Instant Road Repair by International Roadway Research).

4.0 LABORATORY INVESTIGATION

In situ moisture content and unit dry weight (ASTM D 2937-17, as modified for ring liners) were determined for the ring samples. Six untreated bulk samples were tested for the following: maximum density and optimum moisture (ASTM D 1557-12, modified), particle size distribution (ASTM D 422-63/07; D 1140-17), plasticity index (ASTM D 4318-17), and CBR (ASTM D 1883-16, for a range of moisture contents, with ASTM D 1557-12 as the reference standard for maximum density). Two additional bulk samples were tested for the same series of parameters, except that CBR testing was completed with the soils lime treated at 5 percent by dry weight of soil and 3 percent above optimum moisture content only. One other bulk sample was tested for maximum density and optimum moisture (ASTM D 1557-12, modified) only, and three other bulk samples were tested for particle size distribution (ASTM D 422-63/07; D 1140-17) and plasticity index (ASTM D 4318-17) only. Please refer to Appendix B for the laboratory test results.

5.0 GENERAL SUBSURFACE PROFILE

Variations in the thicknesses of the existing pavement sections were observed throughout the borings drilled in the project area.

The AC thicknesses found in the borings varied from as little as 2 inches in Boring 51, to as much as 6 inches in Borings 41 and 58. The majority of the thicknesses measured in the other borings varied from 4 to 5.5 inches. The miscellaneous aggregate base (mAB) supporting the AC varied from 2.5 inches in Boring 55, to as much as 10 inches found in Boring 50.

The pavement sections found in each of the borings are noted on Figures 2A and 2B - Existing Pavement Section Thicknesses, in Appendix C.

Below the pavement sections, layers of well graded sand with varying percentages of silt and gravel, and varying in thickness from 6 to 14 inches, were found in 20 of the 30 borings drilled for this project. Below the well graded sand, and below the pavement sections in all other borings, the underlying soil was sandy lean clay fill, which extended to depths ranging from 4 to 7 feet below the existing pavement surfaces. The consistency of the clays during drilling ranged from soft to very stiff.

Alluvium was found below the fill in all of the borings, to the maximum depth explored of 10 feet below the existing pavement surfaces. The alluvium consisted of very soft to stiff sandy lean clay and sandy silt, and loose silty clayey sand. A layer of loose poorly graded sand was found in Boring 70 from 4.5 to 6 feet.

The soils were described during drilling as being slightly moist to very moist. Subsurface water was not encountered in any of the borings, to the maximum depth explored of 10 feet below the existing pavement surface. However, caliche deposits, a residual mineral in the soil indicating the past presence of subsurface water, were found at various depths in 14 of the 30 borings drilled for this project.

Please refer to the logs in Appendix A for a more complete description of the subsurface conditions found in the borings.

Figures 3A and 3B – USCS Soil Types at Subgrade, in Appendix C, is a summary of the soil types found at or within 1.5 feet of subgrade (i.e., below the pavement sections) in the borings. The well graded sand layers, where found directly below the pavement sections, are also indicated on Figures 3A and 3B.

6.0 CONCLUSIONS

Existing Pavement Sections and Miscellaneous Aggregate Base

The existing pavement sections found in the borings were variable, with the thicknesses of the AC ranging from 2 inches to 6 inches. The miscellaneous aggregate base (mAB) supporting the AC varied from 2.5 inches to 10 inches. No pattern was evident with respect to the thicknesses of the AC or mAB across the project area.

The well graded sand (with variable percentages of silt and gravel) layers found in 20 of the 30 borings appeared to be leveling courses, and it is unclear if they were considered to be part of the overall pavement section when constructed. The material did appear to be from either a production quarry or some other relatively uniform.

The mAB found below the AC in all borings was not uniform and varied from clayey sand with gravel to silty sand with gravel, similar to the material found during our investigation for the Runway 7-25 and Taxiway Connector Improvements Project (ESP 2020). The mAB did not appear to be consistent with typical FAA P-209 or Caltrans Class 2 aggregate base material. Therefore, for the purposes of this report, the material was classified as "miscellaneous aggregate base (mAB)."

CBR Test Results

The laboratory test results indicate variability of the CBR values of the soils based on their USCS type and on their moisture contents. The CBR test results have been summarized on Figures 4a, 4b, 5a and 5b in Appendix C, and the following paragraphs are a discussion regarding use of the data on the maps. Determinations of the actual CBR values and elastic modulus (E) values to be used in either the design for reconstruction of pavement, or the evaluation for rehabilitation of existing pavement, are to be made by the project engineer.

Per AC 150/5320-6F (FAA 2016), Chapter 2.5.3, for flexible pavements, the elastic modulus E can be estimated from CBR test results using the following correlation: E (psi) = 1500 x CBR.

<u>Reconstructed Pavement over Existing Soils</u>

In general, the laboratory CBR test results indicate variations in the strengths of the soils tested based on their density and their moisture content. Variations in the CBR values were noted when moisture contents were above or below optimum moisture content for most of the samples. The summary of CBR values provided in the following paragraph is based on the assumption that the subgrade soils will be recompacted within a moisture conditioned range extending from 2 percent below optimum moisture content to 2 percent above optimum moisture content. If the subgrade soils are not maintained within this range, a reduction in the CBR value will occur. Assuming the CBR values provided in this report for pavement section reconstruction will be utilized for design, the project plans should fully indicate the relatively narrow moisture content range as a specification requirement, to allow the contractor to plan earthwork operations accordingly. Provisions should also be taken (e.g., proper surface drainage and flowlines away

from edges of pavement, regular maintenance of the pavement surface to fill any cracks that develop, etc.) to ensure that the moisture contents of the subgrade soils remain within the design range for the design life of the pavement sections. As noted in the "Subsurface Water and Soil Moisture Contents" Section below, edge drains should be considered to help maintain soil moisture contents following construction.

For fully reconstructed conditions, where the existing pavement sections will be removed and the underlying soils can be moisture conditioned and recompacted, the CBR values of the subgrade soils can be increased in some areas from their *in situ* conditions. However, where the existing conditions are already very well compacted or where a significant thickness of well graded sand fill was present, a *decrease* in the effective CBR value at that location could occur with moisture conditioning and recompaction to a lesser value than the existing conditions, or if the well graded sand fill was removed to expose the underlying sandy lean clay. The most important soil condition achieved with complete reconstruction will be uniformity of subgrade moisture and density. Per FAA AC 150/5320-6F, the degree of relative compaction required at subgrade for any pavement areas where complete reconstruction will be undertaken (and therefore the CBR value that can be used in the reconstruction design) is based on the cohesive/non-cohesive classification of the subgrade soils. Except for the variable thickness layers of well graded sand fill found directly below the pavement in many of the borings, the soils encountered at the site are considered cohesive (plasticity index of 3 or greater, per FAA AC 150/5320-6F, Chapter 3.9.3). Also per FAA AC 150/5320-6F, cohesive soils are required to be compacted at subgrade to a minimum of 95 percent of maximum dry density. Based on previous discussions with the client, given the scattered and inconsistent nature of the well graded sand fill, it was decided to consider all of the subgrade soils on the site as being cohesive, with a compaction standard of 95 percent of maximum dry density.

Figures 4A and 4B in Appendix C are summaries of the CBR values expected at the boring locations, based on the results of our laboratory testing and assuming the soils are compacted to a minimum of 95 percent of maximum dry density within 2 percent of optimum moisture content. Based on previous discussions with the client and reviewing the current laboratory CBR test results and previously developed information (ESP 2020), it is our opinion that an "approximate average" CBR value of 8 can be used in the design of reconstructed pavements for this project. If it is desired to further optimize the pavement design, the design CBR can be increased to 13 for the eastern end of the project area (i.e., the area of Borings 66 through 70).

Reconstructed Pavement over Lime Treated Soil

To provide better subgrade CBR values and to reduce the design section where pavement will be fully reconstructed, lime treatment can be utilized. The existing pavement sections (asphalt concrete - AC and miscellaneous aggregate base - mAB) can also be pulverized/milled in place and mixed with the subgrade, to reduce or even eliminate off-haul and disposal from demolition, and to provide a stronger subgrade material than the native soils. Milled pavement section material should be thoroughly mixed with the native soils using disks or other suitable equipment, prior to shaping to provide the design crowned subgrade section. Final mixing of the materials after shaping will be completed during the lime treatment process by pugmills. Lime treatment of the native soils mixed with milled AC/mAB material will likely provide a superior subgrade material for support of new pavement, when compared to untreated native soils, or to lime treated native soils without milled AC/mAB.

Samples of the subgrade soils only (without milled AC/mAB) from Boring 45 and Boring 62 were tested for CBR value with a lime treatment percentage of 5 percent by dry weight of soil, and at 3 percent above optimum moisture content. The lime treatment percentage was selected based on previous lab test results for the Runway 7-25 and Taxiway Connector Improvements Project (ESP 2020), and discussions with the client and a lime treatment contractor. The lime treatment percentage, as well as the moisture content at test, were also selected based on sulfate testing that was completed in parallel with the CBR tests. The results of the sulfate testing are provided under separate cover. Based on the laboratory test results, the CBR values for the site soils lime-treated at a minimum of 5 percent by dry weight, compacted to a minimum of 95 percent of maximum dry density, and with moisture contents as high as 3 percent over optimum, are expected to range from 40 to 50. If utilized, the lime treated soil layer should be 12 to 16 inches thick. A thicker section may be appropriate for areas of the site where in situ soil moisture contents are well above optimum and construction equipment traffic may cause instability. The actual thickness of lime treated soil to be utilized should be determined by the engineer.

If the existing pavement sections are milled and stockpiled for later reuse as mAB, it is anticipated that some or all of the well graded sand with silt and gravel layers found in 20 of the 30 borings drilled for this project will be removed in the process. To maintain uniformity for the lime treatment process, any well graded sand and/or mAB layers remaining after the milling process should be removed from the lime treatment zone and properly disposed off site or reused where acceptable on site. Alternately, if the quantity of well graded sand and/or mAB in the lime

treatment zone is significant, the additive can be switched from lime to cement. The need to make this switch should be determined based on the conditions exposed at the time of construction.

CBR Value for Existing Miscellaneous Aggregate Base (mAB)

A sample of the miscellaneous aggregate base (mAB) from Boring 46 was also tested for CBR. As previously discussed with the client, considering its variability, it was decided that the mAB material was not consistent enough to be able to assume with any certainty that it would be capable of being compacted to 100 percent of maximum dry density with a reasonable amount of effort. Based on the test data, an approximate CBR value of 30 is recommended for the mAB material compacted to a minimum of 95 percent of maximum dry density within two percent of optimum moisture content.

Rehabilitation of Existing Pavements

Figures 5A and 5B in Appendix C show the estimated CBR values of the subgrade soils at each boring location, based on their existing density and moisture contents, and on the results of the laboratory CBR tests. Note that in 4 of the 30 borings, the existing soil moisture contents and/or densities were beyond the range of the data from the laboratory CBR tests; those locations are marked on the map with an asterisk. Where the CBR information appeared to follow a trend line beyond the data range, a rough estimate of the CBR value was provided. Where the soil moisture contents and/or density values were well out of the data range or did not appear to follow a trend line at all, no CBR value was provided, and the location was indicated with a question mark (?). Based on previous discussions with the client, and considering the variability of the in situ moisture, density and CBR test results, it is our opinion that a CBR value of only 1 or 2 should be used for the subgrade in its existing condition when evaluating the potential for rehabilitation of the existing pavement in the center and on the end of the taxiway (i.e., the vicinity of Borings 51 through 70). For the western portion of the taxiway (i.e., vicinity of Borings 41 through 50), the CBR value utilized for the evaluation could be increased to 5 or 6.

As noted in the "Subsurface Water and Soil Moisture Contents" Section below, edge drains should be considered to help maintain soil moisture contents following construction.

Swelling Soils

AC 150/5320-6F (FAA 2016) Chapter 3.10.1 describes the effects that swelling soils have on airport pavements, and recommends various treatments (removal and replacement, stabilization, modified compaction efforts and adequate drainage) to reduce the potential for damage to pavements due to swelling soils.

Chapter 3.10.2 (FAA 2016) indicates swelling soils "usually have liquid limits above 40 and plasticity indexes above 25." None of the soils tested for this project meet these criteria.

Chapter 3.10.3 (FAA 2016) indicates soils with a swell of greater than 3 percent when tested for CBR require treatment to reduce the potential for damage to pavements. Only one sample exhibited a swell of greater than 3 percent when tested for CBR value:

- Boring 66 from 4.0 to 5.0 feet. Expansion values ranged from 5.3 to 6.8 percent after soaking for the samples compacted at 3 percent below optimum moisture content. Samples compacted at optimum moisture content exhibited expansion values of 1.5 to 3.9 percent after soaking. Samples compacted at 3 percent above optimum exhibited expansion values of 0.9 percent or less after soaking.

Chapter 3.10.1 (FAA 2016) states "Local experience and judgment should be applied in dealing with swelling soils to achieve the best results." The material utilized for CBR testing from Boring 66 that exhibited swell in excess of 3 percent was found in the following borings: Boring 62 from 5.0 to 10.0 feet; Borings 63 through 69 from 4.0 to 10.0 feet; and in Boring 70 from 6.0 to 10 feet. It is our understanding that the pavement at Oxnard Airport does not exhibit pervasive evidence of damage due to swelling soils, i.e., significant edge cracking or random surface unevenness. Due to the lack of existing apparent damage due to swelling soils, and as this material was identified at depths of 4.0 feet or greater, in our opinion it is probably not worth considering in a standard pavement rehabilitation process (i.e., reconstruction with a conventional pavement section over compacted native soil, or rehabilitation of the existing pavement in place).

If the engineer elects to lime treat the native soils for the reconstruction process, the lime treatment will neutralize whatever potential swelling soils may be present in the subgrade treatment zone and no additional action would be necessary.

Earthwork Shrinkage

Soil volume loss, or "shrinkage", during earthwork can be attributed to three categories; soil loss due to stripping or demolition of existing improvements, subsidence of the underlying soils due to compaction, and shrinkage of fill soil as it is placed and compacted. These factors are partly due to the soil characteristics, but largely due to depths of cuts and fills, stripping techniques, type and weight of earthwork equipment, traffic pattern of earthwork equipment, and soil moisture at the time of grading.

In paved areas that are to be reconstructed, removal of distinct AC and AB layers can result in less loss than from removal of vegetation in unpaved areas, if any. The amount of soil loss that will occur is largely dependent upon how careful the contractor is in stripping and demolition/removal operations.

Subsidence of the site due to compaction of the soils below a fill area also occurs. Subsidence due to compaction is likely to be in the range of 0.1 to 0.2 feet. The main zone of subsidence is typically the upper two to three feet. Deeper subsidence is not expected as earthwork operations for pavement reconstruction are expected to be limited to the upper 1 to 2 feet in the project area.

To estimate shrinkage of the subgrade, *in situ* soil density data from ring samples taken in the borings at approximate subgrade elevation were analyzed. Appendix D contains a summary of the existing relative compaction at each depth where a ring sample was secured, as well as calculated shrinkage assuming final relative compaction values ranging from 95 to 100 percent.

As loss, subsidence, and shrinkage are only partly due to the soil characteristics, and are largely influenced by the earthwork equipment, earthwork methods, and soil moisture, these factors cannot be precisely estimated.

Subsurface Water and Soil Moisture Contents

Subsurface water was not encountered in any of the borings to the maximum depth drilled of 10 feet below the existing pavement surface. However, caliche deposits, a residual mineral in the soil indicating the past presence of subsurface water, were found at various depths in 14 of the 30 borings drilled for this project. Caliche is an indicator that significant soil moisture contents have been present in the past. If soil moisture contents are well above optimum in pavement areas to be reconstructed, the soils could become unstable under equipment traffic. Unstable conditions hinder compaction efforts and are not acceptable to support fill or pavement section placement. All grading areas should be firm and unyielding following compaction operations and prior to placement of fill, aggregate base or pavement.

Depending on the time of year that construction operations take place, the most effective methods to deal with unstable conditions due to high soil moisture could be scarification and aeration, or the use of geotextile stabilization fabrics. Scarification and aeration may only be possible if the weather conditions are clear and if the project schedule permits.

If the project schedule will not allow drying of the soil naturally, stabilization fabric could be

utilized. Additional excavation below subgrade may also be needed before the stabilization fabric is placed; the depth of overexcavation should be determined by the geotechnical engineer based on conditions exposed at the time of construction. After all excavations are complete, and prior to placement of the geotextiles, the exposed surfaces are typically back-dragged to a smooth condition to the degree practicable with light earthwork equipment. Geotextile stabilization fabric (Mirafi RS380i or similar material depending on the degree of instability) is typically placed in the excavated area and extended up the sidewalls of the excavation to within 2 inches of the bottom of the AC layer. Stabilization fabrics are rolled out along the long dimension of the reconstruction area (not perpendicular to it), and are stretched, overlapped and held in place according to the manufacturer's recommendations. Recycled subbase and/or imported aggregate base, per the overall pavement section design, is placed over the fabric in thin, moisture-conditioned lifts and compacted. Recycled subbase and/or aggregate base is placed by end-dumping on the fabric and spreading ahead of equipment; equipment traffic is typically not allowed to travel directly over the fabric. Initial lifts of subbase/base are spread and compacted by rubber-tired equipment; subsequent lifts are compacted using sheepsfoot and/or steel-drum equipment. Compaction equipment is usually operated in static mode only until base grade is reached, to reduce the potential for any free water in the underlying soils to be drawn through the fabric and into the subbase or aggregate base.

If it appears that stable conditions will not be created at base grade after the use of geotextiles, a layer of geogrid (Tensar TriAx TX-7 or similar material) can be placed according to the manufacturer's recommendations as additional reinforcement at the approximate mid-depth of the subbase/aggregate base layer. Often sufficient material may not be in place over the geotextile stabilization fabric at mid-depth of the design subbase/aggregate base layer to fully mobilize its strength characteristics and to determine if geogrid will be needed, therefore it may be necessary to construct a full-scale test strip of the pavement section, with and without geogrid reinforcement. This test strip will give an indication as to whether or not geogrids will be required in any reconstruction areas.

Figures 6A and 6B – Subgrade Soil Moisture Content in Appendix C show the soil moisture contents at the time of our field exploration, and percentage above (or below) optimum moisture content. These data show that in the majority of the boring locations, soil moisture contents were above optimum moisture content, with one location at 9 percent above optimum. As noted in the "CBR Test Results" Section of this report, the CBR values decrease significantly with increasing soil moisture contents. To reduce the potential for accumulated moisture in the

subgrade and the subsequent loss of soil strength (CBR value), positive surface drainage away from all paved areas must be provided. Edge drains adjacent to the pavement are also recommended. The drains could consist of conventional geotextile-wrapped and gravel-filled trenches with perforated collection pipes, or prefabricated panel-type drainage systems that are placed in narrow trenches. The 3- to 4-inch diameter perforated collection pipes in conventional trenches have the advantage of being able to be fitted with cleanouts for system maintenance; however, this could be outweighed by the relatively low cost of a thin panel drain system, as gravel drains require excavation of wider trenches, trench spoil disposal, and gravel placement. The actual type of system to be utilized, if any, should be determined by the engineer. The drains should be placed, wherever practicable, to dewater the upper 2 to 3 feet of soil below the pavement sections.

Soil Erodibility

The site soils are considered to be erodible. It is essential that all surface drainage be controlled and directed to appropriate discharge points, and that surface soils, particularly those disturbed during construction, are stabilized by vegetation or other means during and following construction.

7.0 OBSERVATION AND TESTING

1. It must be recognized that the recommendations contained in this report are based on a limited number of borings and rely on continuity of the subsurface conditions encountered. Therefore, the geotechnical engineer should be retained to provide consultation during the design phase, to review plans as they near completion, to interpret this report during construction, and to provide construction monitoring in the form of testing and observation.

2. At a minimum, the following should be provided by the geotechnical engineer during construction:

    - Professional observation during grading
    - Oversight of special inspection during grading

3. Special inspection of grading should be provided as per the requirements of the FAA or Section 1705.6 and Table 1705.6 of the CBC; the soils special inspector should be under the direction of the geotechnical engineer. Subject to approval by the building official or other jurisdiction, special inspection requirements should be addressed by the

geotechnical engineer during the preconstruction meeting (see below) prior to the start of grading operations.

At a minimum, the following items should be inspected and/or tested by the special inspector:

- Stripping and clearing of vegetation and existing pavement where planned for removal
- Excavations to subgrade in any pavement reconstruction areas, and corrective operations (scarification/aeration or placement of geotextile stabilization fabric) in any unstable areas
- Excavations to subgrade in any pavement reconstruction areas and scarification, moisture conditioning, and recompaction in stable areas
- Fill, milled/pulverized AC (if any) and imported aggregate base quality, placement, moisture conditioning, and compaction
- Utility trench backfill

4. A program of quality control should be developed prior to beginning grading. The contractor or project manager should determine any additional inspection items required by the architect/engineer or the governing jurisdiction.

5. Locations and frequency of compaction tests should be as per the recommendation of the geotechnical engineer at the time of construction. The recommended test location and frequency may be subject to modification by the geotechnical engineer, based upon soil and moisture conditions encountered, size and type of equipment used by the contractor, the general trend of the results of compaction tests, or other factors.

6. A preconstruction conference among the owner, the geotechnical engineer, the governing agency, the special inspector, the project inspector, the architect/engineer, and contractors is recommended to discuss planned construction procedures and quality control requirements.

7. The geotechnical engineer should be notified at least 48 hours prior to beginning construction operations. If Earth Systems Pacific is not retained to provide construction

observation and testing services, it shall not be responsible for the interpretation of the information by others or any consequences arising therefrom.

8.0 CLOSURE

Our intent was to perform the investigation in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the locality of this project and under similar conditions. No representation, warranty, or guarantee is either expressed or implied. This report is intended for the exclusive use by the client as discussed in the "Scope of Services" section. Application beyond the stated intent is strictly at the user's risk.

This report is valid for conditions as they exist at this time for the type of project described herein. The conclusions and recommendations contained in this report could be rendered invalid, either in whole or in part, due to changes in building codes, FAA regulations, standards of geotechnical or construction practice, changes in physical conditions, or the broadening of knowledge.

If changes with respect to development type or location become necessary, if items not addressed in this report are incorporated into plans, or if any of the assumptions used in the preparation of this report are not correct, this firm shall be notified for modifications to this report. Any items not specifically addressed in this report should comply with the FAA, the CBC and/or the requirements of the governing jurisdiction.

The preliminary recommendations of this report are based upon the geotechnical conditions encountered at the site and may be augmented by additional requirements of the engineer, or by additional recommendations provided by this firm based on conditions exposed at the time of construction.

This document, the data, conclusions, and recommendations contained herein are the property of Earth Systems Pacific. This report shall be used in its entirety, with no individual sections reproduced or used out of context. Copies may be made only by Earth Systems Pacific, the client, and the client's authorized agents for use exclusively on the subject project. Any other use is subject to federal copyright laws and the written approval of Earth Systems Pacific.

Thank you for this opportunity to have been of service. If you have any questions, please feel free to contact this office at your convenience.

End of Text.

TECHNICAL REFERENCES

ESP. (Earth Systems Pacific). December 31, 2015. Geotechnical Engineering Report, Taxiway and Apron PCN Calculations, Oxnard Airport, Oxnard, California. Mead & Hunt, Inc., Project No. 3138400-150628.01

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Miller. (Miller Geosciences, Inc.). August 28, 2014. Preliminary Geotechnical Explorations, Proposed Improvements, Oxnard Airport Runway, 2889 West 5th Street, Oxnard, California.

APPENDIX A

Figures 1A and 1B – Exploration Location Maps

Boring Log Legend

Boring Logs

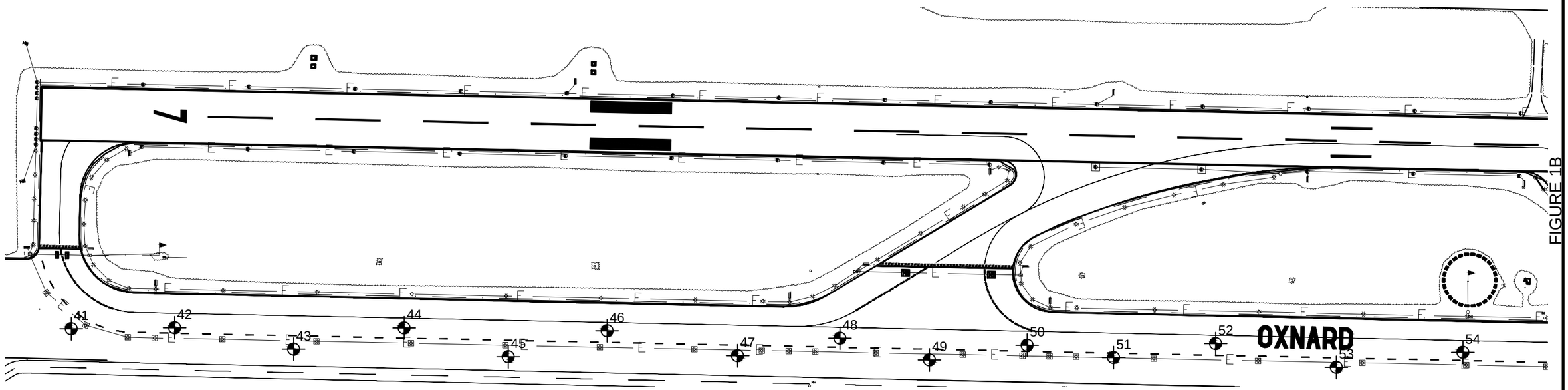


FIGURE 1B

LEGEND

41-70 Boring Location (Approx.)

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

N

NOT TO SCALE

OXNARD AIRPORT TAXIWAY F IMPROVEMENTS021320maps

Earth Systems Pacific
4378 Old Santa Fe Road, San Luis Obispo, CA 93401
www.earthsystems.com
(805) 544-3276 • Fax (805) 544-1786

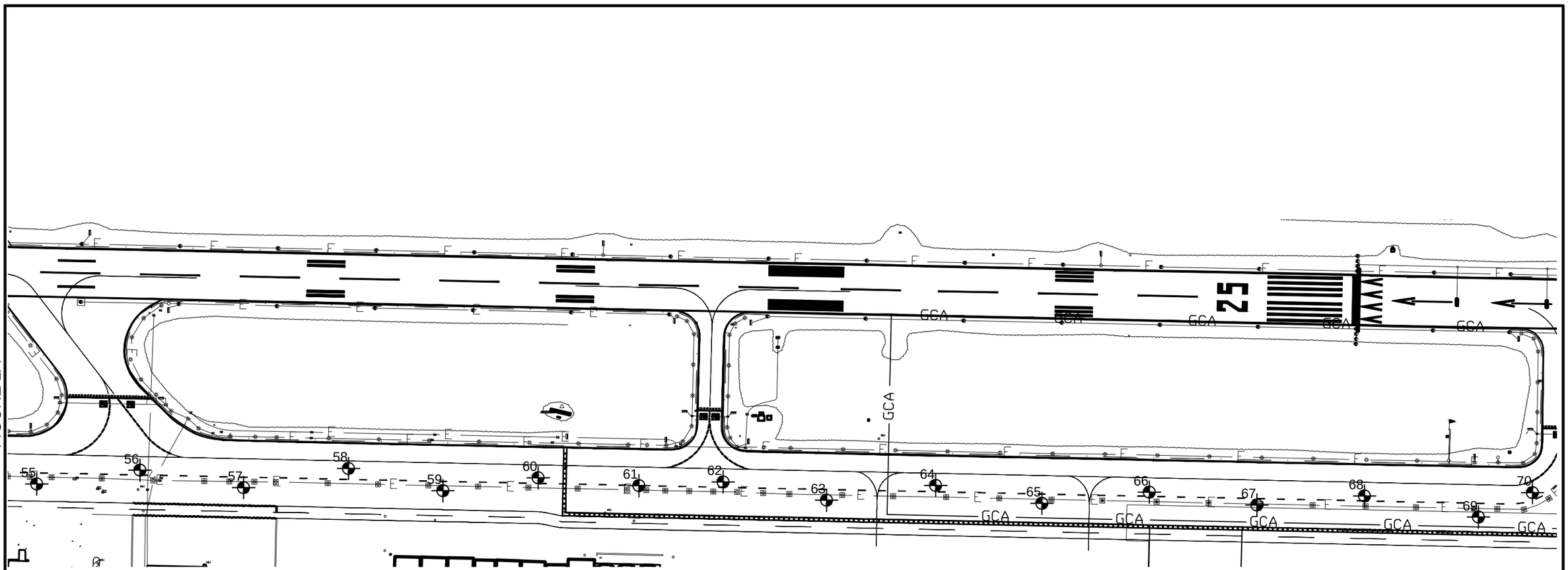
FIGURE 1A - EXPLORATION LOCATION MAP

Oxnard Airport - Taxiway F Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

Project No.
302524-002

FIGURE 1A



LEGEND

41-70 Boring Location (Approx.)

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

N

NOT TO SCALE

Earth Systems Pacific
4378 Old Santa Fe Road, San Luis Obispo, CA 93401
www.earthsystems.com
(805) 544-3276 • Fax (805) 544-1786

FIGURE 1B - EXPLORATION LOCATION MAP

Oxnard Airport - Taxiway F Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

Project No.
302524-002

Sheet 2 of 2

OXNARD AIRPORT TAXIWAY F IMPROVEMENTS021320maps

Earth Systems Pacific

BORING LOG LEGEND

SAMPLE / SUBSURFACE WATER SYMBOLS	GRAPH. SYMBOL
CALIFORNIA MODIFIED	
STANDARD PENETRATION TEST (SPT)	
SHELBY TUBE	
BULK	
SUBSURFACE WATER DURING DRILLING	
SUBSURFACE WATER AFTER DRILLING	

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

MAJOR DIVISIONS	GROUP SYMBOL	TYPICAL DESCRIPTIONS	GRAPH. SYMBOL
COARSE GRAINED SOILS (MORE THAN HALF OF MATERIAL IS LARGER THAN #200 SIEVE SIZE)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
	GP	POORLY GRADED GRAVELS, OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, NON-PLASTIC FINES	
	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, PLASTIC FINES	
	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	
	SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES	
	SM	SILTY SANDS, SAND-SILT MIXTURES, NON-PLASTIC FINES	
	SC	CLAYEY SANDS, SAND-CLAY MIXTURES, PLASTIC FINES	
FINE GRAINED SOILS (HALF OR MORE OF MATERIAL IS SMALLER THAN #200 SIEVE SIZE)	ML	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS	
	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS	
	PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	

OBSERVED MOISTURE CONDITION

DRY	SLIGHTLY MOIST	MOIST	VERY MOIST	WET (SATURATED)

CONSISTENCY

COARSE GRAINED SOILS			FINE GRAINED SOILS		
BLOWS/FOOT		DESCRIPTIVE TERM	BLOWS/FOOT		DESCRIPTIVE TERM
SPT	CA SAMPLER		SPT	CA SAMPLER	
0-10	0-16	LOOSE	0-2	0-3	VERY SOFT
11-30	17-50	MEDIUM DENSE	3-4	4-7	SOFT
31-50	51-83	DENSE	5-8	8-13	MEDIUM STIFF
OVER 50	OVER 83	VERY DENSE	9-15	14-25	STIFF
			16-30	26-50	VERY STIFF
			OVER 30	OVER 50	HARD

GRAIN SIZES

U.S. STANDARD SERIES SIEVE				CLEAR SQUARE SIEVE OPENING		
# 200	# 40	# 10	# 4	3/4"	3"	12"

SILT & CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

TYPICAL BEDROCK HARDNESS

MAJOR DIVISIONS	TYPICAL DESCRIPTIONS
EXTREMELY HARD	CORE, FRAGMENT, OR EXPOSURE CANNOT BE SCRATCHED WITH KNIFE OR SHARP PICK; CAN ONLY BE CHIPPED WITH REPEATED HEAVY HAMMER BLOWS
VERY HARD	CANNOT BE SCRATCHED WITH KNIFE OR SHARP PICK; CORE OR FRAGMENT BREAKS WITH REPEATED HEAVY HAMMER BLOWS
HARD	CAN BE SCRATCHED WITH KNIFE OR SHARP PICK WITH DIFFICULTY (HEAVY PRESSURE); HEAVY HAMMER BLOW REQUIRED TO BREAK SPECIMEN
MODERATELY HARD	CAN BE GROOVED 1/16 INCH DEEP BY KNIFE OR SHARP PICK WITH MODERATE OR HEAVY PRESSURE; CORE OR FRAGMENT BREAKS WITH LIGHT HAMMER BLOW OR HEAVY MANUAL PRESSURE
SOFT	CAN BE GROOVED OR GOUGED EASILY BY KNIFE OR SHARP PICK WITH LIGHT PRESSURE, CAN BE SCRATCHED WITH FINGERNAIL; BREAKS WITH LIGHT TO MODERATE MANUAL PRESSURE
VERY SOFT	CAN BE READILY INDENTED, GROOVED OR GOUGED WITH FINGERNAIL, OR CARVED WITH KNIFE; BREAKS WITH LIGHT MANUAL PRESSURE

TYPICAL BEDROCK WEATHERING

MAJOR DIVISIONS	TYPICAL DESCRIPTIONS
UNWEATHERED	NO DISCOLORATION, NOT OXIDIZED
SLIGHTLY WEATHERED	DISCOLORATION OR OXIDATION IS LIMITED TO SURFACE OF, OR SHORT DISTANCE FROM, FRACTURES: SOME FELDSPAR CRYSTALS ARE DULL
MODERATELY WEATHERED	DISCOLORATION OR OXIDATION EXTENDS FROM FRACTURES, USUALLY THROUGHOUT; Fe-Mg MINERALS ARE "RUSTY", FELDSPAR CRYSTALS ARE "CLOUDY"
HIGHLY WEATHERED	DISCOLORATION OR OXIDATION THROUGHOUT; FELDSPAR AND Fe-Mg MINERALS ARE ALTERED TO CLAY TO SOME EXTENT, OR CHEMICAL ALTERATION PRODUCES IN SITU DISAGGREGATION
DECOMPOSED	DISCOLORATION OR OXIDATION THROUGHOUT, BUT RESISTANT MINERALS SUCH AS QUARTZ MAY BE UNALTERED; FELDSPAR AND Fe-Mg MINERALS ARE COMPLETELY ALTERED TO CLAY

drafting/masters/Boring Log Legend 062719.dwg

Earth Systems Pacific

Boring No. 41

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/8/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			6.0" AC / 4.0" SILTY SAND with GRAVEL (Misc. AB)					
1	CL		SANDY LEAN CLAY; dark brown, stiff, moist (Fill)					
2				1.5 - 3.0	■	107.9	16.9	4 5 11
3				1.5 - 5.0	○			
4								
5			soft	5.0 - 6.5	●			2 0 1
6								
7	CL		SANDY LEAN CLAY; brown, medium stiff, moist (Alluvium)					
8				8.5 - 10.0	●			1 2 3
9								
10								
11			TD: 10.0'					
12			No subsurface water encountered					
13			Backfilled with cuttings and tamped					
14			AC Patch					
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 42

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/8/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		4.5" AC / 4.5" SILTY SAND with GRAVEL (Misc. AB)					
1	SW	WELL GRADED SAND with GRAVEL; light brown, loose, moist (Fill)					
2	CL	SANDY LEAN CLAY; dark brown, stiff, moist	1.5 - 3.0	■	112.3	15.5	7 9 12
5		medium stiff	5.0 - 6.5	●			4 3 3
7	ML	SANDY SILT; light brown, medium stiff, moist (Alluvium)	8.5 - 10.0	●			1 2 3
10		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 43

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

PAGE 1 OF 1
JOB NO.: 302524-002
DATE: 10/8/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			5.5" AC / 5.0" SILTY SAND with GRAVEL (Misc. AB)					
1	CL		SANDY LEAN CLAY; dark brown, stiff, moist	1.0 - 2.5	■	115.9	15.1	4 9 17
4			soft					
5	CL		SANDY LEAN CLAY; brown, medium stiff, moist (Alluvium)	5.0 - 6.5	●			1 2 2
8				8.5 - 10.0	●			0 1 1
9			very soft					
10			TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ◯ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 44

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/8/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4.0" AC / 6.5" SILTY SAND with GRAVEL (Misc. AB)					
1	SW		WELL GRADED SAND with GRAVEL; light brown, loose, moist (Fill)					
2	CL		SANDY LEAN CLAY; dark brown, very stiff, moist	1.5 - 3.0	■	120.7	6.9	10 13 17
3								
4								
5	CL		SANDY LEAN CLAY; brown, soft, moist (Alluvium)	5.0 - 6.5	●			1 2 2
6								
7								
8				8.5 - 10.0	●			0 1 3
9								
10			TD: 10.0'					
11			No subsurface water encountered					
12			Backfilled with cuttings and tamped					
13			AC Patch					
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ◯ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 45

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/8/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		4.0" AC / 5.5" SILTY SAND with GRAVEL (Misc. AB)					
1	CL	SANDY LEAN CLAY; dark brown, stiff, moist (Fill)	1.0 - 2.5	Ring	106.3	18.6	4, 7, 9
3			1.0 - 5.0	Grab			
4		soft					
5	ML	SANDY SILT; light brown, soft, moist (Alluvium)	5.0 - 6.5	SPT			1, 1, 3
8			8.5 - 10.0	SPT			0, 2, 2
10		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: Ring Sample Grab Sample Shelby Tube Sample SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 46

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/8/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4.0" AC / 6.0" SILTY SAND with GRAVEL (Misc. AB)					
1	SW -SM		WELL GRADED SAND with SILT and GRAVEL; light brown, loose, moist (Fill)	1.0 - 2.5	■	117.1	3.7	12, 16, 17
2	CL		SANDY LEAN CLAY; dark brown, very stiff, moist	1.0 - 2.0	○			
5			soft	5.0 - 6.5	●			2, 2, 2
6	CL		SANDY LEAN CLAY; brown, soft, moist (Alluvium)					
8			some oxidation	8.5 - 10.0	●			1, 2, 1
10			TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 47

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

PAGE 1 OF 1
JOB NO.: 302524-002
DATE: 10/8/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			4.0" AC / 7.0" SILTY SAND with GRAVEL (Misc. AB)					
1	SW -SM		WELL GRADED SAND with SILT and GRAVEL; light brown, loose, moist (Fill)	1.0 - 2.5	■	116.4	13.1	8, 14, 22
2	CL		SANDY LEAN CLAY; dark brown, very stiff, moist					
5	ML		SANDY SILT; light brown, medium stiff, moist (Alluvium)	5.0 - 6.5	●			1, 2, 3
9			yellow brown to olive brown, soft	8.5 - 10.0	●			0, 1, 3
10			TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ◯ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 48

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/9/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		5.0" AC / 3.5" SILTY SAND with GRAVEL (Misc. AB)					
1	SW-SM	WELL GRADED SAND with SILT and GRAVEL; light brown, loose, moist (Fill)	1.0 - 2.5	■	114.8	12.1	4, 8, 8
2	CL	SANDY LEAN CLAY; dark brown, loose, moist					
4		medium stiff					
5	CL	SANDY LEAN CLAY; brown, medium stiff, moist, caliche (Alluvium)	5.0 - 6.5	●			2, 4, 5
8	ML	SANDY SILT; light brown, soft	8.5 - 10.0	●			2, 1, 2
10		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 49

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/9/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			5.5" AC / 5.5" SILTY SAND with GRAVEL (Misc. AB)					
1	CL		SANDY LEAN CLAY; dark brown, stiff, moist (Fill)	1.0 - 2.5	■	114.7	12.9	3, 6, 8
5	CL		SANDY LEAN CLAY; brown, medium stiff, moist (Alluvium)	5.0 - 6.5	●			1, 3, 3
8	ML		SILT; light brown, medium stiff, moist	8.5 - 10.0	●			1, 2, 3
10			TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 50

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/9/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		4.5" AC / 10.0" SILTY SAND with GRAVEL (Misc. AB)					
1	CL	SANDY LEAN CLAY; dark brown, very stiff, moist (Fill)	1.0 - 2.5	■	119.0	13.0	6, 16, 17
4		soft					
5	ML	SANDY SILT; light brown, very soft, moist, caliche (Alluvium)	5.0 - 6.5	●			1, 0, 1
8		yellow brown, soft	8.5 - 10.0	●			1, 1, 2
10		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 51

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/9/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			2.0" AC / 5.5" SILTY SAND with GRAVEL (Misc. AB)					
1	CL		SANDY LEAN CLAY; dark brown, stiff, moist (Fill)	1.0 - 2.5	■	111.4	15.8	4 6 11
5	CL		SANDY LEAN CLAY; brown, soft, moist, caliche (Alluvium)	5.0 - 6.5	●			1 2 2
8	ML		SANDY SILT; yellow brown, medium stiff, moist	8.5 - 10.0	●			1 2 3
10			TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 52

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/9/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		4.5" AC / 6.0" SILTY SAND with GRAVEL (Misc. AB)					
1 - 2	SW	WELL GRADED SAND with GRAVEL; light brown, loose, moist (Fill)	1.5 - 3.0	▬	114.6	11.6	9 14 22
3 - 4	SC	SANDY LEAN CLAY; dark brown, very stiff, moist					
5 - 6	CL	SANDY LEAN CLAY; brown, medium stiff, moist, caliche (Alluvium)	5.0 - 6.5	●			1 2 4
7 - 8	ML	SANDY SILT; yellow brown, soft, moist	8.5 - 10.0	●			1 2 1
9 - 10							
11 - 12		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					
13 - 14							
15 - 16							
17 - 18							
19 - 20							
21 - 22							
23 - 24							
25 - 26							

LEGEND: ▬ Ring Sample ◯ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 53

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/9/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			3.5" AC / 5.0" SILTY SAND with GRAVEL (Misc. AB)					
1	CL		SANDY LEAN CLAY; dark brown, stiff, moist (Fill)	1.0 - 2.5	■	110.1	15.3	3, 9, 14
4	CL		SANDY LEAN CLAY; light brown, soft, moist, caliche (Alluvium)	5.0 - 6.5	●			1, 1, 3
				7.5 - 10.0	○			
				8.5 - 10.0	●			2, 2, 2
10			TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 54

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/9/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		5.5" AC / 6.0" SILTY SAND with GRAVEL (Misc AB)					
1	SW	POORLY GRADED SAND with GRAVEL; light brown, loose, moist (Fill)	1.5 - 3.0	■	124.3	5.2	8 11 15
2	CL	SANDY LEAN CLAY; dark brown, stiff, moist					
4	CL	SANDY LEAN CLAY; brown, medium stiff, moist, (Alluvium)	4.0 - 5.0	○			0 2 4
5			5.0 - 6.5	●			
8	ML	SANDY SILT; yellow brown, medium stiff, moist, caliche	8.5 - 10.0	●			3 3 3
10		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 55

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/9/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		4.5" AC / 2.5" SILTY SAND with GRAVEL (Misc. AB)					
1	SW	POORLY GRADED SAND with GRAVEL; light brown, loose, moist (Fill)	1.0 - 2.5	■	108.9	14.4	5, 6, 8
2	CL	SANDY LEAN CLAY; dark brown, medium stiff, moist	1.5 - 5.0	○			
5	ML	SANDY SILT; light brown, stiff, moist, caliche (Alluvium)	5.0 - 6.5	●			1, 3, 6
9		medium stiff	8.5 - 10.0	●			1, 3, 3
10		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 56

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/9/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		4.5" AC / 5.0" SILTY SAND with GRAVEL (Misc. AB)					
1	SW	POORLY GRADED SAND with GRAVEL; light brown, loose, moist (Fill)	1.5 - 3.0	■	116.0	12.0	7 7 7
2	CL	SANDY LEAN CLAY; dark brown, medium stiff, moist					
5	ML	SANDY SILT; light brown, medium stiff, moist, (Alluvium)	5.0 - 6.5	●			2 2 5
9		light brown to gray brown, caliche	8.5 - 10.0	●			2 3 3
10		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 57

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

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JOB NO.: 302524-002
DATE: 10/10/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
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Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			3.5" AC / 9.0" SILTY SAND with GRAVEL (Misc. AB)					
1	SW		WELL GRADED SAND with GRAVEL; light brown, loose, moist (Fill)	1.0 - 2.5	■	117.6	2.7	8 9 11
2	CL		SANDY LEAN CLAY; dark brown, stiff, moist					
5	CL		SANDY LEAN CLAY; brown, soft, moist, caliche (Alluvium)	5.0 - 6.5	●			1 1 2
8			light brown, very soft	8.5 - 10.0	●			0 1 1
10			TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 58

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/10/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		6.0" AC / 7.0" SILTY SAND with GRAVEL (Misc. AB)					
1	SW	WELL GRADED SAND with GRAVEL; light brown, loose, moist (Fill)	1.5 - 3.0	■	115.5	12.1	5 7 11
2	CL	SANDY LEAN CLAY; dark brown, stiff, moist					
5	CL	SANDY LEAN CLAY; brown, very soft, moist (Alluvium)	5.0 - 6.5	●			0 1 1
7	ML	SILT; light brown, soft, moist	8.5 - 10.0	●			0 1 2
10		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 59

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/10/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		5.0" AC / 6.0" SILTY SAND with GRAVEL (Misc. AB)					
1	SW	WELL GRADED SAND with GRAVEL; light brown, loose, moist (Fill)	1.5 - 3.0	■	110.8	13.7	5, 11, 15
2	CL	SANDY LEAN CLAY; dark brown, stiff, moist					
5	CL	SANDY LEAN CLAY; brown, medium stiff, moist, caliche (Alluvium)	5.0 - 6.5	●			1, 3, 3
9	ML	SANDY SILT; light brown, slightly moist, medium stiff	8.5 - 10.0	●			3, 4, 4
10		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 60

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/10/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		4.5" AC / 6.5" SILTY SAND with GRAVEL (Misc. AB)					
1	SW	WELL GRADED SAND with GRAVEL; light brown, loose, moist (Fill)	1.0 - 2.5	■	119.8	7.1	14 16 17
2	CL	SANDY LEAN CLAY; dark brown, very stiff, moist					
5	ML	SANDY SILT; light brown, soft, moist (Alluvium)	5.0 - 6.5	●			1 1 3
8	CL	SANDY LEAN CLAY; brown, very soft, moist, caliche	8.5 - 10.0	●			0 0 2
10		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 61

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/10/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			5.5" AC / 9.0" SILTY SAND with GRAVEL (Misc. AB)					
1	SW		WELL GRADED SAND with GRAVEL; light brown, loose, moist (Fill)	1.5 - 3.0	■	112.4	14.5	4 7 9
2	CL		SANDY LEAN CLAY; dark brown, stiff, moist					
3								
4	CL		SANDY LEAN CLAY; brown, soft, moist					
5				5.0 - 6.5	●			0 1 2
6								
7								
8				8.5 - 10.0	●			1 1 3
9			Caliche					
10								
11			TD: 10.0'					
12			No subsurface water encountered					
13			Backfilled with cuttings and tamped					
14			AC Patch					
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 62

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/10/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		4.5" AC / 9.0" SILTY SAND with GRAVEL (Misc. AB)					
1 - 2	SW	WELL GRADED SAND with GRAVEL; light brown, loose, moist (Fill)	1.5 - 3.0	■	90.7	12.2	7 7 8
2 - 3	CL	SANDY LEAN CLAY; dark brown, stiff, moist	2.0 - 5.0	○			
4 - 5			5.0 - 6.5	●			1 2 2
5 - 8	SC -SM	SILTY, CLAYEY SAND; dark brown, loose, moist (Alluvium)					
8		caliche	8.5 - 10.0	●			0 1 2
10 - 26		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 63

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/10/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0			3.5" AC / 7.0" SILTY SAND with GRAVEL (Misc. AB)					
1 - 2 - 3	CL		SANDY LEAN CLAY; dark brown, very stiff, slightly moist (Fill)	1.0 - 2.5	■	77.9	12.4	29 17 14
4 - 5 - 6 - 7	SC -SM		SILTY, CLAYEY SAND; dark brown, loose, moist (Alluvium)	5.0 - 6.5	●			1 3 4
8 - 9 - 10				8.5 - 10.0	●			0 1 1
11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 19 - 20 - 21 - 22 - 23 - 24 - 25 - 26			TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 64

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/10/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		2.5" AC / 5.5" AC / 6.0" SILTY SAND with GRAVEL (Misc. AB)					
1	SW	WELL GRADED SAND with GRAVEL; light brown, loose, moist (Fill)	1.0 - 2.5	■	104.3	3.4	7 4 6
2	CL	SANDY LEAN CLAY; dark brown, medium stiff, moist					
4	SC -SM	SILTY, CLAYEY SAND; brown, loose, moist, caliche (Alluvium)	5.0 - 6.5	●			0 2 3
8		soft	8.5 - 10.0	●			0 1 2
10		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 65

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/11/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		3.0" AC / 6.0" SILTY SAND with GRAVEL (Misc. AB)					
1	CL	SANDY LEAN CLAY; dark brown, medium stiff, moist (Fill)	1.0 - 2.5	Ring	102.3	19.0	3 4 5
4	SC -SM	SILTY CLAYEY SAND; dark brown, loose, moist (Alluvium)	5.0 - 6.5	SPT			0 1 1
8			8.5 - 10.0	SPT			0 1 2
10		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 66

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/11/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		4.0" AC / 7.5" SILTY SAND with GRAVEL (Misc. AB)					
1	SW	WELL GRADED SAND with GRAVEL; light brown, loose, moist (Fill)	1.0 - 2.5	■	115.4	14.8	12 12 16
2	CL	SANDY LEAN CLAY; dark brown, very stiff, moist					
4	SC -SM	SILTY, CLAYEY SAND; dark brown, loose, moist, caliche (Alluvium)	4.0 - 5.0	○			1 1 2
5			5.0 - 6.5	●			
8			8.5 - 10.0	●			0 2 2
10		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 67

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/11/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		5.0" AC / 7.0" SILTY SAND with GRAVEL (Misc. AB)					
1 - 2 - 3	CL	SANDY LEAN CLAY; brown, loose, moist (Fill)	1.0 - 2.5	▬	106.7	12.9	5 5 6
4 - 5 - 6 - 7 - 8 - 9 - 10	SC -SM	SILTY, CLAYEY SAND; dark brown, loose, moist (Alluvium)	5.0 - 6.5	●			1 3 3
			8.5 - 10.0	●			2 3 7
11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 19 - 20 - 21 - 22 - 23 - 24 - 25 - 26		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ▬ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 68

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/11/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		5.5" AC / 5.5" SILTY SAND with GRAVEL (Misc. AB)					
1	SW	WELL GRADED SAND with GRAVEL; light brown, loose, moist (Fill)	1.0 - 2.5	■	112.7	2.8	12 8 7
2	CL	SANDY LEAN CLAY; dark brown, stiff, moist					
4	SC -SM	SILTY CLAYEY SAND; dark brown, loose, moist (Alluvium)	5.0 - 6.5	●			2 3 4
8		brown, caliche	8.5 - 10.0	●			2 3 5
10		TD: 10.0' No subsurface water encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 69

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/11/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		3.5" AC / 7.0" SILTY SAND with GRAVEL (Misc. AB)					
1	SW	WELL GRADED SAND with GRAVEL; light brown, loose, moist (Fill)	1.0 - 2.5	■	126.1	14.2	5, 8, 8
2	CL	SANDY LEAN CLAY; dark brown, stiff, moist					
4	SC -SM	SILTY CLAYEY SAND; dark brown, loose, moist (Alluvium)	5.0 - 6.5	●			1, 2, 2
8			8.5 - 10.0	●			1, 3, 5
10		TD: 10.0' No subsurface groundwater encountered Backfilled with cuttings and tamped AC Patch					

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 70

LOGGED BY: S. Hemmer
DRILL RIG: Mobile B-53 with Automatic Hammer
AUGER TYPE: 6" Hollow Stem

JOB NO.: 302524-002
DATE: 10/11/19

OXNARD AIRPORT
TAXIWAY F IMPROVEMENTS
2889 West 5th Street
Oxnard, California

DEPTH (feet)	USCS CLASS	SOIL DESCRIPTION	SAMPLE DATA: INTERVAL (feet)	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.
0		5.0" AC / 6.5" SILTY SAND with GRAVEL (Misc. AB)					
1	SW	WELL GRADED SAND with GRAVEL; light brown, loose, moist (Fill)	1.0 - 2.5	■	118.0	13.2	12, 13, 20
2	CL	SANDY LEAN CLAY; dark brown, very stiff, moist					
3			1.5 - 4.5	○			
4							
5	SP	POORLY GRADED SAND; light brown, loose, moist (Alluvium)	5.0 - 6.5	●			2, 2, 1
6							
7	SC -SM	SILTY, CLAYEY SAND; dark brown, loose, moist, caliche					
8							0, 1, 1
9		caliche	8.5 - 10.0	●			
10							
11		TD: 10.0'					
12		No subsurface water encountered					
13		Backfilled with cuttings and tamped					
14		AC Patch					
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

LEGEND: ■ Ring Sample ○ Grab Sample ▭ Shelby Tube Sample ● SPT

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

APPENDIX B

Laboratory Test Results

Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

BULK DENSITY TEST RESULTS

ASTM D 2937-17 (modified for ring liners)

February 11, 2020

BORING NO.	DEPTH feet	MOISTURE CONTENT, %	WET DENSITY, pcf	DRY DENSITY, pcf
41	1.0 - 1.5	16.9	126.1	107.9
42	1.5 - 2.0	15.5	129.7	112.3
43	1.0 - 1.5	15.1	133.4	115.9
44	1.5 - 2.0	6.9	129.0	120.7
45	1.0 - 1.5	18.6	126.0	106.3
46	1.0 - 1.5	3.7	121.4	117.1
47	1.0 - 1.5	13.1	131.7	116.4
48	1.0 - 1.5	12.1	128.7	114.8
49	1.0 - 1.5	12.9	129.5	114.7
50	1.0 - 1.5	13.0	134.5	119.0
51	1.0 - 1.5	15.8	128.9	111.4
52	1.5 - 2.0	11.6	127.9	114.6
53	1.0 - 1.5	15.3	126.9	110.1
54	1.5 - 2.0	5.2	130.8	124.3
55	1.0 - 1.5	14.4	124.6	108.9
56	1.5 - 2.0	12.0	129.9	116.0
57	1.0 - 1.5	2.7	120.8	117.6
58	1.5 - 2.0	12.1	129.6	115.5
59	1.5 - 2.0	13.7	125.9	110.8
60	1.0 - 1.5	7.1	128.3	119.8
61	1.5 - 2.0	14.5	128.7	112.4
62	1.5 - 2.0	12.2	101.7	90.7
63	1.0 - 1.5	12.4	87.6	77.9
64	1.0 - 1.5	3.4	107.8	104.3
65	1.0 - 1.5	19.0	121.8	102.3
66	1.0 - 1.5	14.8	132.4	115.4
67	1.0 - 1.5	12.9	120.5	106.7
68	1.0 - 1.5	2.8	115.9	112.7
69	1.0 - 1.5	14.2	144.0	126.1
70	1.0 - 1.5	13.2	133.6	118.0

Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

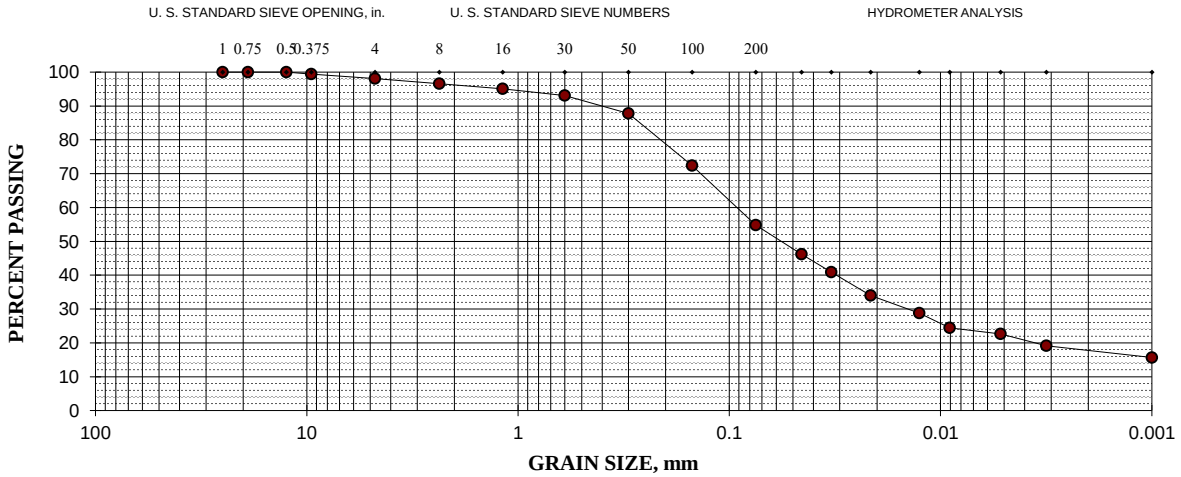
PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

Boring #41 @ 1.5 - 5.0'
Dark Brown Sandy Lean Clay (CL)
LL = 28; PL = 17; PI = 11

February 11, 2020
Specific Gravity = 2.70 (assumed)
Gravel = 2%; Sand = 43%; Silt = 32%; Clay = 23%

Sieve size	% Retained	% Passing
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	1	99
#4 (4.75-mm)	2	98
#8 (2.36-mm)	3	97
#16 (1.18-mm)	5	95
#30 (600-µm)	7	93
#50 (300-µm)	12	88
#100 (150-µm)	28	72
#200 (75-µm)	45	55
Hydrometer Analysis		
46-µm		46
33-µm		41
21-µm		34
13-µm		29
9-µm		24
5.2-µm		23
3.2-µm		19
Colloids		16



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

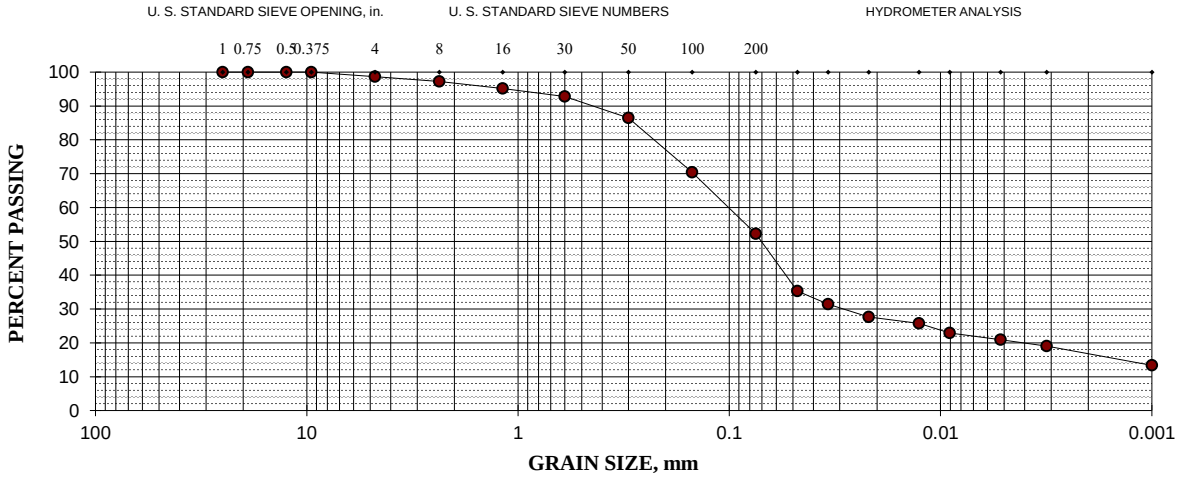
PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

Boring #45 @ 1.0 - 5.0'
Dark Brown Sandy Lean Clay (CL)
LL = 29; PL = 19; PI = 10

February 11, 2020
Specific Gravity = 2.70 (assumed)
Gravel = 1%; Sand = 47%; Silt = 31%; Clay = 21%

Sieve size	% Retained	% Passing
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	1	99
#8 (2.36-mm)	3	97
#16 (1.18-mm)	5	95
#30 (600-µm)	7	93
#50 (300-µm)	14	86
#100 (150-µm)	30	70
#200 (75-µm)	48	52
Hydrometer Analysis		
48-µm		35
34-µm		31
22-µm		28
13-µm		26
9-µm		23
5.2-µm		21
3.1-µm		19
Colloids		13



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

Boring #46 @ 1.0 - 2.0'

February 11, 2020

Light Brown Well-Graded Sand with Silt and Gravel (SW-SM)

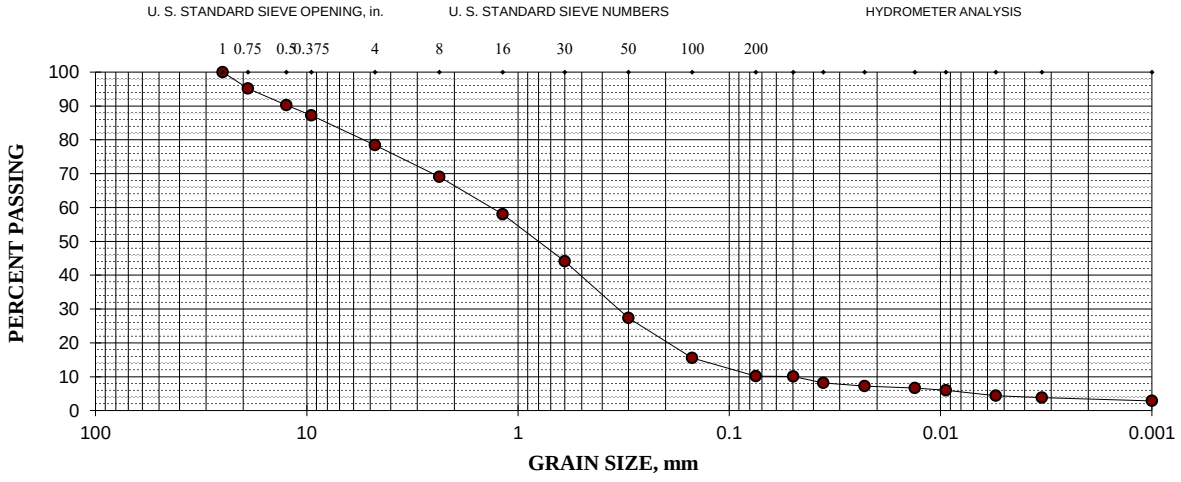
Specific Gravity = 2.65 (assumed)

PI = NP (Non-plastic)

Gravel = 22%; Sand = 68%; Silt = 6%; Clay = 4%

Cu = 27.3; Cc = 1.7

Sieve size	% Retained	% Passing
1" (25.0-mm)	0	100
3/4" (19.0-mm)	5	95
1/2" (12.5-mm)	10	90
3/8" (9.5-mm)	13	87
#4 (4.75-mm)	22	78
#8 (2.36-mm)	31	69
#16 (1.18-mm)	42	58
#30 (600-µm)	56	44
#50 (300-µm)	73	27
#100 (150-µm)	84	16
#200 (75-µm)	90	10
Hydrometer Analysis		
50-µm		10
36-µm		8
23-µm		7
13-µm		7
9-µm		6
5.5-µm		4
3.3-µm		4
Colloids		3



Oxnard Airport Taxiway F Improvements
Oxnard, California

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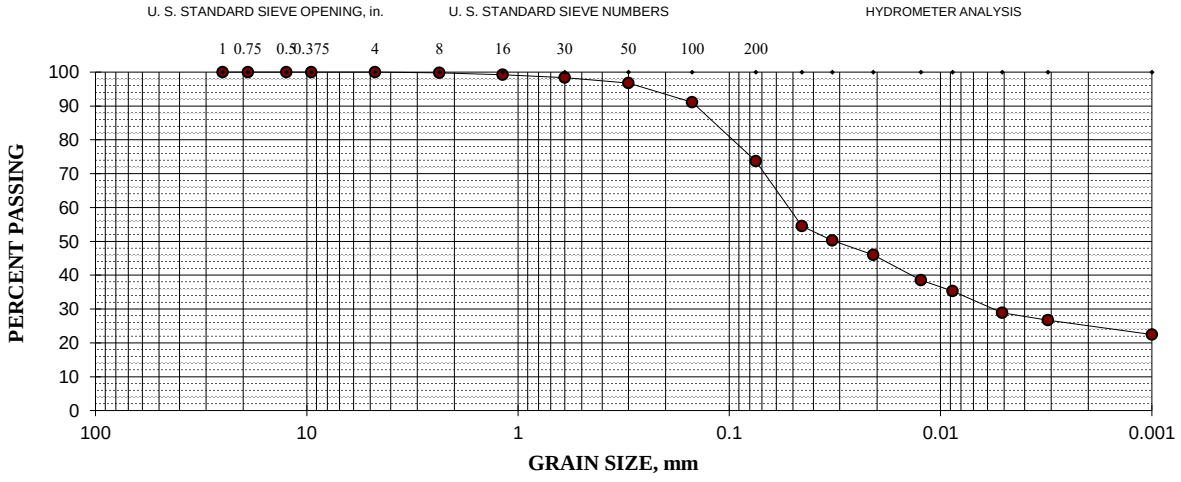
PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

Boring #53 @ 7.5 - 10.0'
Light Brown Sandy Lean Clay (CL)
LL = 36; PL = 19; PI = 17

February 11, 2020
Specific Gravity = 2.70 (assumed)
Gravel = 0%; Sand = 26%; Silt = 45%; Clay = 29%

Sieve size	% Retained	% Passing
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	0	100
#8 (2.36-mm)	0	100
#16 (1.18-mm)	1	99
#30 (600-µm)	2	98
#50 (300-µm)	3	97
#100 (150-µm)	9	91
#200 (75-µm)	26	74
Hydrometer Analysis		
45-µm		55
32-µm		50
21-µm		46
12-µm		38
9-µm		35
5.1-µm		29
3.1-µm		27
Colloids		22



Oxnard Airport Taxiway F Improvements
Oxnard, California

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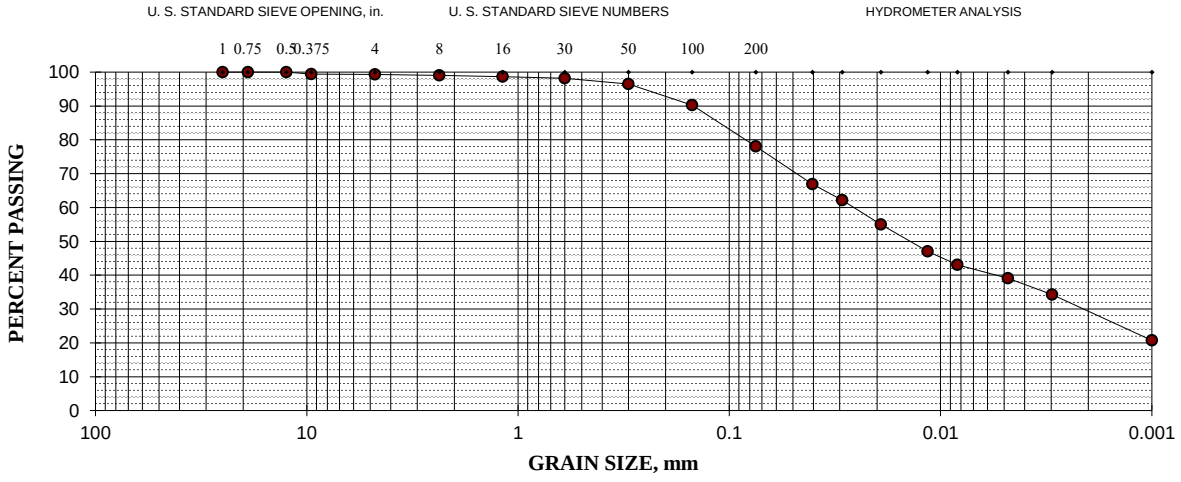
PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

Boring #54 @ 4.0 - 5.0'
Dark Brown Sandy Lean Clay (CL)
LL = 39; PL = 18; PI = 21

February 11, 2020
Specific Gravity = 2.70 (assumed)
Gravel = 1%; Sand = 21%; Silt = 39%; Clay = 39%

Sieve size	% Retained	% Passing
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	1	99
#4 (4.75-mm)	1	99
#8 (2.36-mm)	1	99
#16 (1.18-mm)	1	99
#30 (600-µm)	2	98
#50 (300-µm)	3	97
#100 (150-µm)	10	90
#200 (75-µm)	22	78
Hydrometer Analysis		
40-µm		67
29-µm		62
19-µm		55
11-µm		47
8-µm		43
4.8-µm		39
3.0-µm		34
Colloids		21



Oxnard Airport Taxiway F Improvements
Oxnard, California

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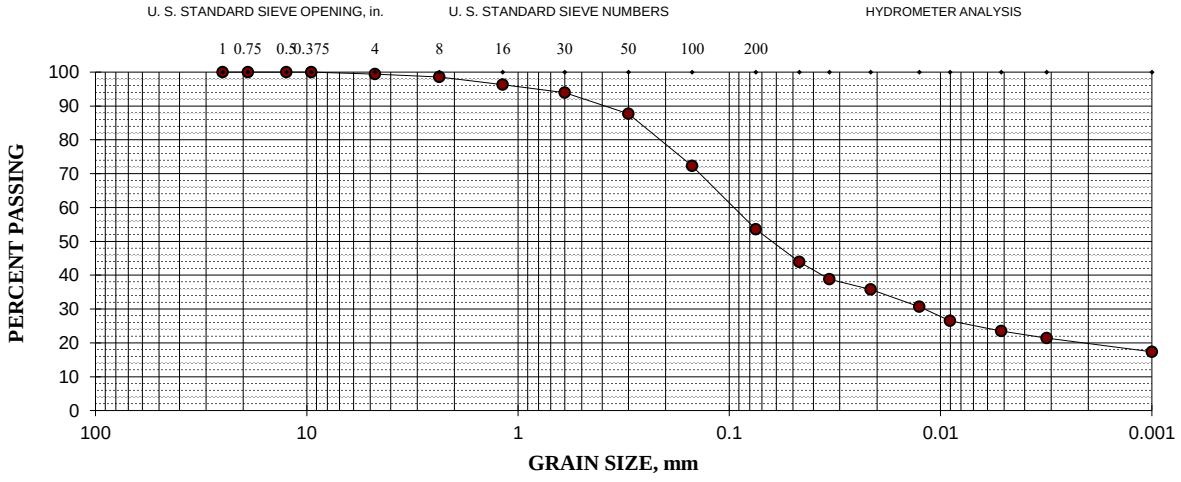
PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

Boring #55 @ 1.5 - 5.0'
Dark Brown Sandy Lean Clay (CL)
LL = 30; PL = 19; PI = 11

February 11, 2020
Specific Gravity = 2.70 (assumed)
Gravel = 1%; Sand = 45%; Silt = 31%; Clay = 23%

Sieve size	% Retained	% Passing
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	1	99
#8 (2.36-mm)	1	99
#16 (1.18-mm)	4	96
#30 (600-µm)	6	94
#50 (300-µm)	12	88
#100 (150-µm)	28	72
#200 (75-µm)	46	54
Hydrometer Analysis		
47-µm		44
34-µm		39
21-µm		36
13-µm		31
9-µm		27
5.2-µm		23
3.1-µm		21
Colloids		17



Oxnard Airport Taxiway F Improvements
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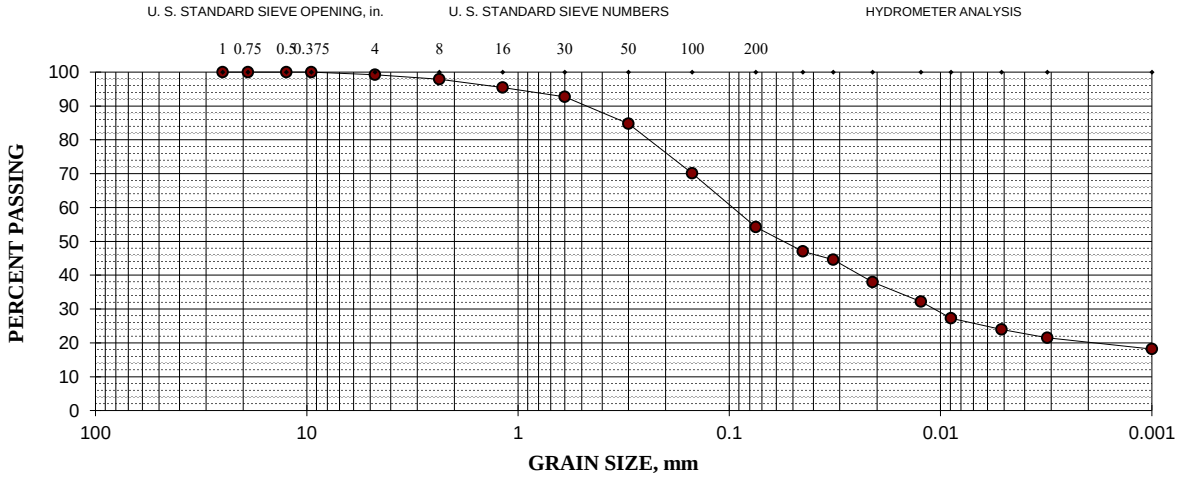
PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

Boring #62 @ 2.0 - 5.0'
Dark Brown Sandy Lean Clay (CL)
LL = 27; PL = 18; PI = 9

February 11, 2020
Specific Gravity = 2.70 (assumed)
Gravel = 1%; Sand = 45%; Silt = 30%; Clay = 24%

Sieve size	% Retained	% Passing
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	1	99
#8 (2.36-mm)	2	98
#16 (1.18-mm)	5	95
#30 (600-µm)	7	93
#50 (300-µm)	15	85
#100 (150-µm)	30	70
#200 (75-µm)	46	54
Hydrometer Analysis		
45-µm		47
32-µm		45
21-µm		38
12-µm		32
9-µm		27
5.1-µm		24
3.1-µm		21
Colloids		18



Oxnard Airport Taxiway F Improvements
Oxnard, California

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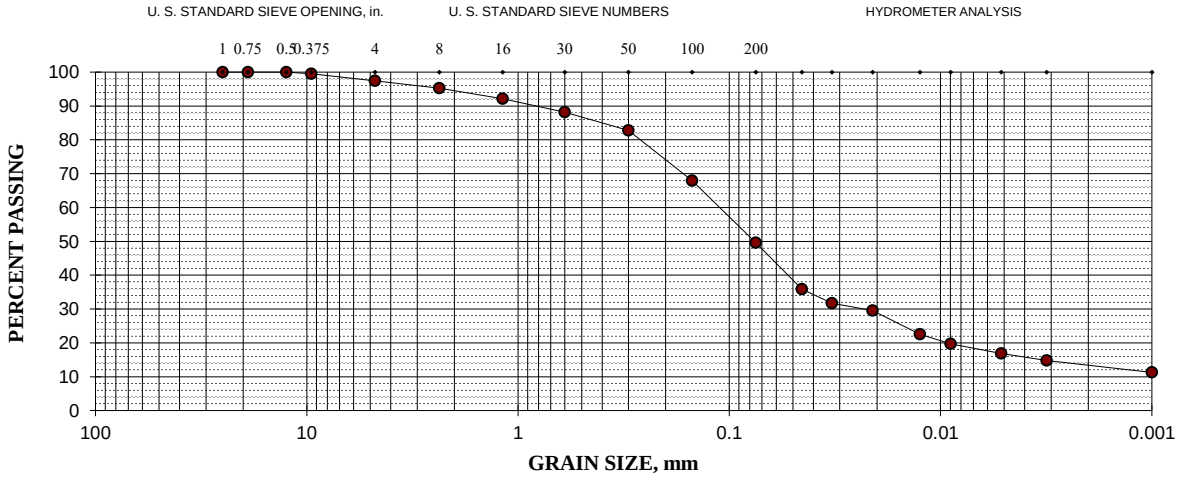
PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

Boring #66 @ 4.0 - 5.0'
Dark Brown Silty, Clayey Sand (SC-SM)
LL = 27; PL = 21; PI = 6

February 11, 2020
Specific Gravity = 2.70 (assumed)
Gravel = 3%; Sand = 47%; Silt = 33%; Clay = 17%

Sieve size	% Retained	% Passing
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	1	99
#4 (4.75-mm)	3	97
#8 (2.36-mm)	5	95
#16 (1.18-mm)	8	92
#30 (600-µm)	12	88
#50 (300-µm)	17	83
#100 (150-µm)	32	68
#200 (75-µm)	50	50
Hydrometer Analysis		
45-µm		36
33-µm		32
21-µm		30
13-µm		23
9-µm		20
5.2-µm		17
3.1-µm		15
Colloids		11



Oxnard Airport Taxiway F Improvements
Oxnard, California

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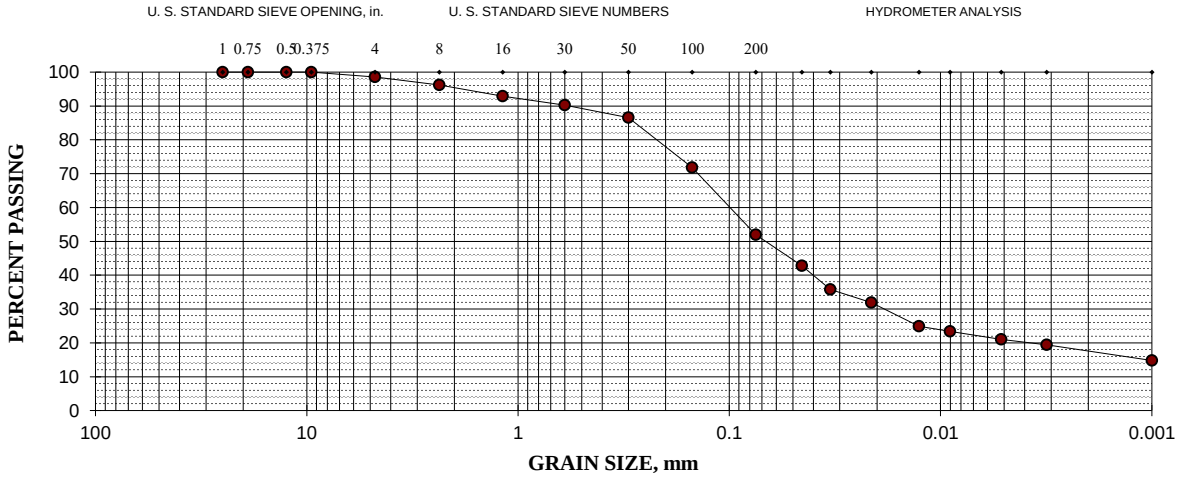
PARTICLE SIZE ANALYSIS

ASTM D 422-63/07

Boring #70 @ 1.5 - 4.5'
Dark Brown Sandy Lean Clay (CL)
LL = 28; PL = 20; PI = 8

February 11, 2020
Specific Gravity = 2.70 (assumed)
Gravel = 1%; Sand = 47%; Silt = 31%; Clay = 21%

Sieve size	% Retained	% Passing
1" (25.0-mm)	0	100
3/4" (19.0-mm)	0	100
1/2" (12.5-mm)	0	100
3/8" (9.5-mm)	0	100
#4 (4.75-mm)	1	99
#8 (2.36-mm)	4	96
#16 (1.18-mm)	7	93
#30 (600-µm)	10	90
#50 (300-µm)	13	87
#100 (150-µm)	28	72
#200 (75-µm)	48	52
Hydrometer Analysis		
45-µm		43
33-µm		36
21-µm		32
13-µm		25
9-µm		23
5.2-µm		21
3.1-µm		19
Colloids		15



Oxnard Airport Taxiway F Improvements
Oxnard, California

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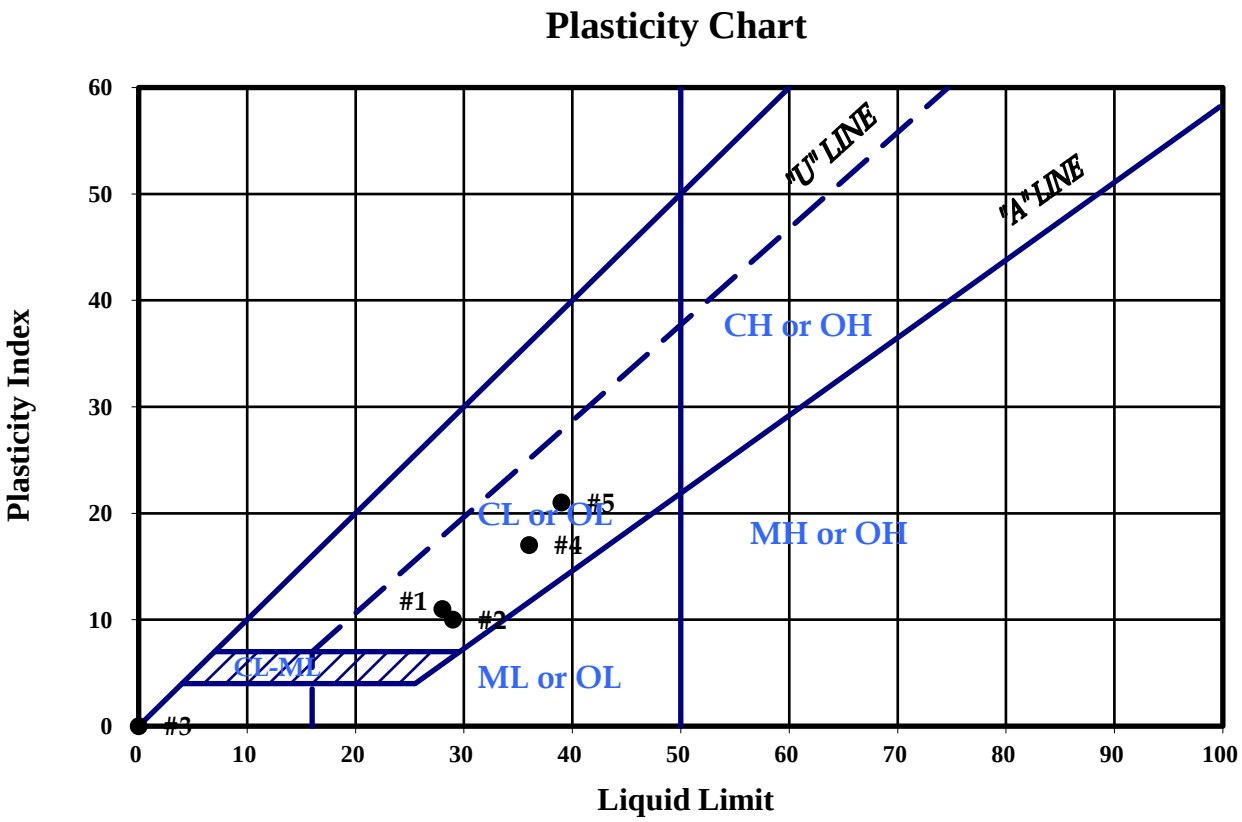
PLASTICITY INDEX

ASTM D 4318-17

February 11, 2020

Test No.:	1	2	3	4	5
Boring No.:	41	45	46	53	54
Sample Depth:	1.5 - 5.0'	1.0 - 5.0'	1.0 - 2.0'	7.5 - 10.0'	4.0 - 5.0'
Liquid Limit:	28	29	NL	36	39
Plastic Limit:	17	19	NP	19	18
Plasticity Index:	11	10	NP	17	21



Oxnard Airport Taxiway F Improvements
Oxnard, California

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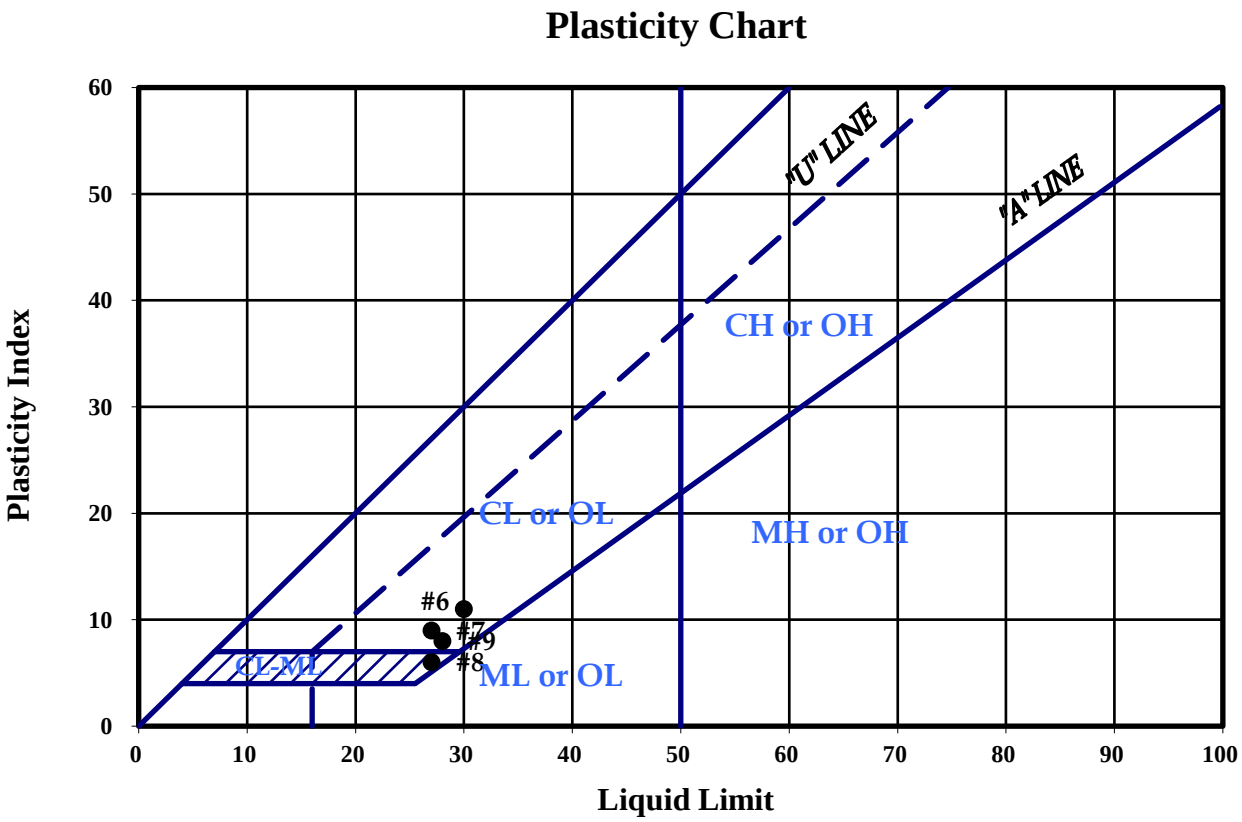
PLASTICITY INDEX

ASTM D 4318-17

February 11, 2020

Test No.:	6	7	8	9	10
Boring No.:	55	62	66	70	
Sample Depth:	1.5 - 5.0'	2.0 - 5.0'	4.0 - 5.0'	1.5 - 4.0'	
Liquid Limit:	30	27	27	28	
Plastic Limit:	19	18	21	20	
Plasticity Index:	11	9	6	8	



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

MOISTURE-DENSITY COMPACTION TEST with 5% Lime, B.D.W.

ASTM D 1557-12 (Modified)

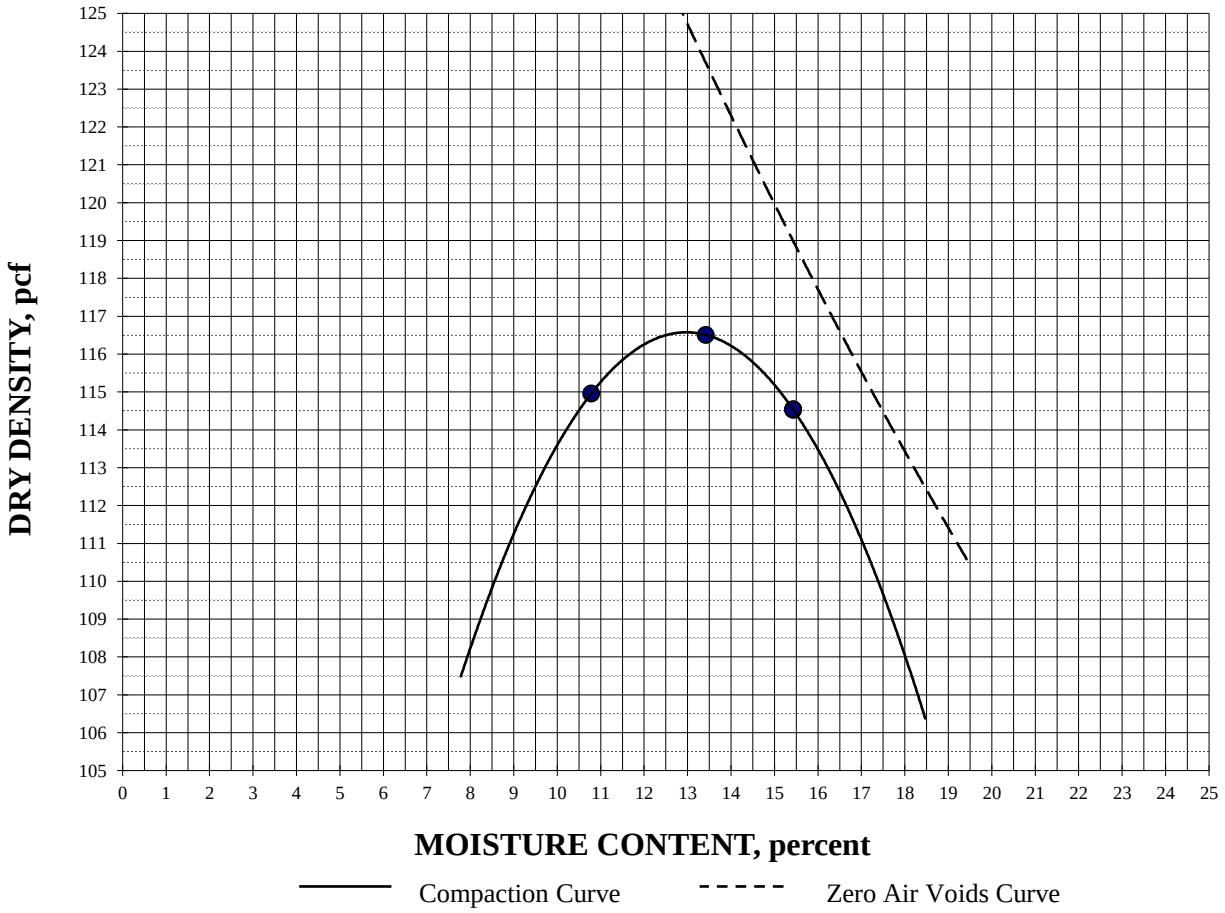
PROCEDURE USED: A
PREPARATION METHOD: Moist
RAMMER TYPE: Mechanical
SPECIFIC GRAVITY: 2.70 (assumed)

February 11, 2020
Boring #41 @ 1.5 - 5.0'
Dark Brown Sandy Lean Clay (CL)
With 5% Lime by Dry Weight

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	1
#4	2

MAXIMUM DRY DENSITY: 116.6 pcf
OPTIMUM MOISTURE: 13.0%



Oxnard Airport Taxiway F Improvements
Oxnard, California

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MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

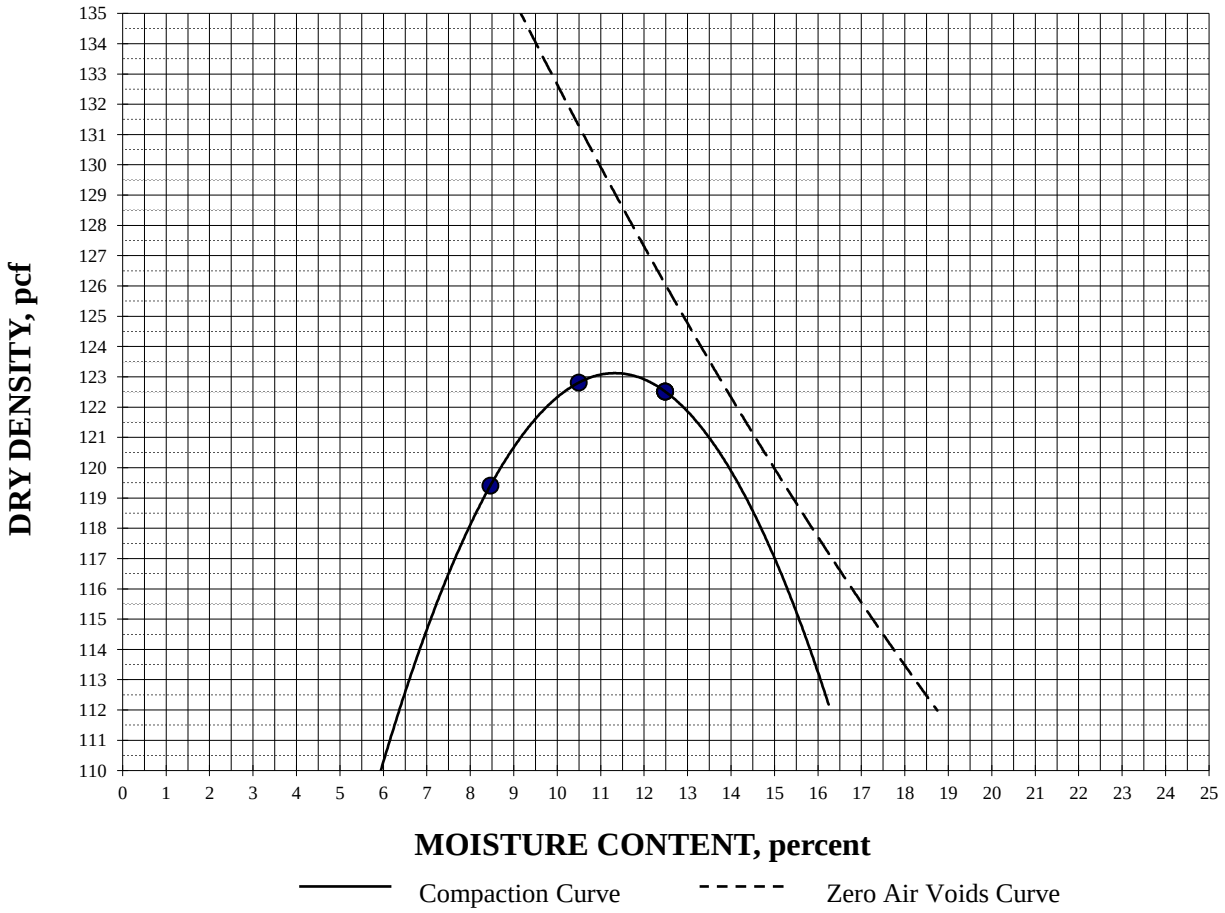
PROCEDURE USED: A
PREPARATION METHOD: Moist
RAMMER TYPE: Mechanical
SPECIFIC GRAVITY: 2.70 (assumed)

February 11, 2020
Boring #45 @ 1.0 - 5.0'
Dark Brown Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	0
#4	1

MAXIMUM DRY DENSITY: 123.1 pcf
OPTIMUM MOISTURE: 11.3%



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

PROCEDURE USED: B

PREPARATION METHOD: Moist

RAMMER TYPE: Mechanical

SPECIFIC GRAVITY: 2.65 (assumed)

February 11, 2020

Boring #46 @ 1.0 - 2.0'

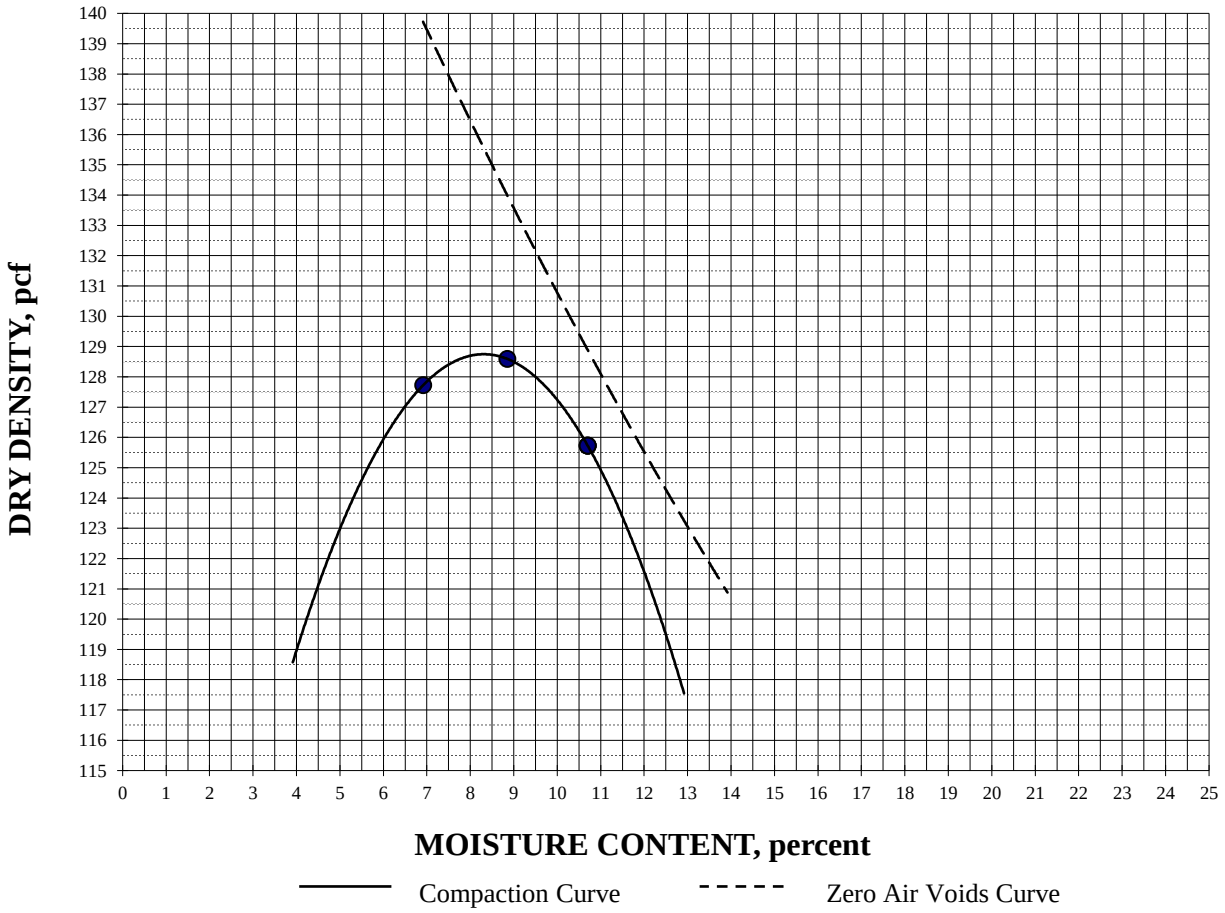
Light Brown Well-Graded Sand with Silt and Gravel (SW-SM)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	5
3/8"	13
#4	22

MAXIMUM DRY DENSITY: 128.7 pcf

OPTIMUM MOISTURE: 8.3%



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

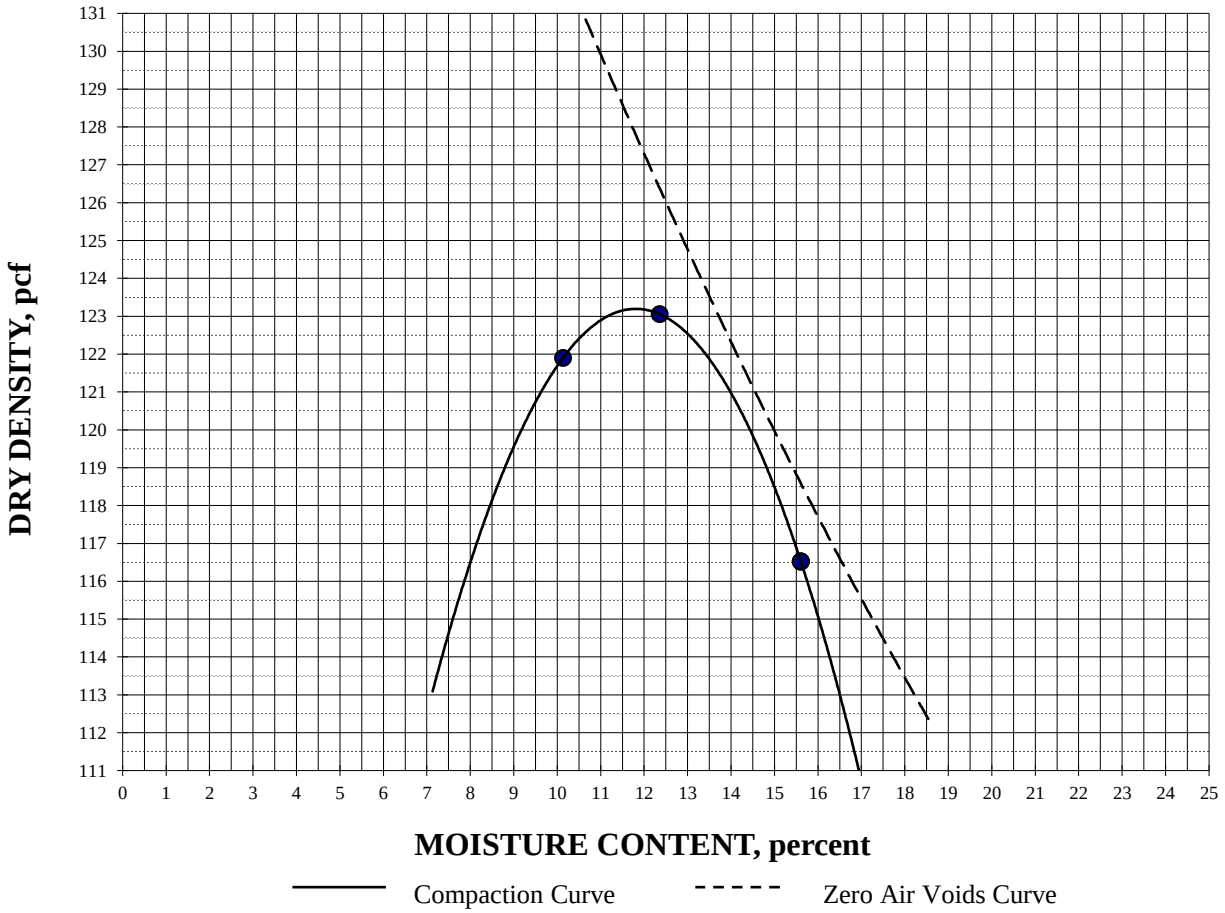
PROCEDURE USED: A
PREPARATION METHOD: Moist
RAMMER TYPE: Mechanical
SPECIFIC GRAVITY: 2.70 (assumed)

February 11, 2020
Boring #53 @ 7.5 - 10.0'
Light Brown Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	0
#4	0

MAXIMUM DRY DENSITY: 123.2 pcf
OPTIMUM MOISTURE: 11.8%



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

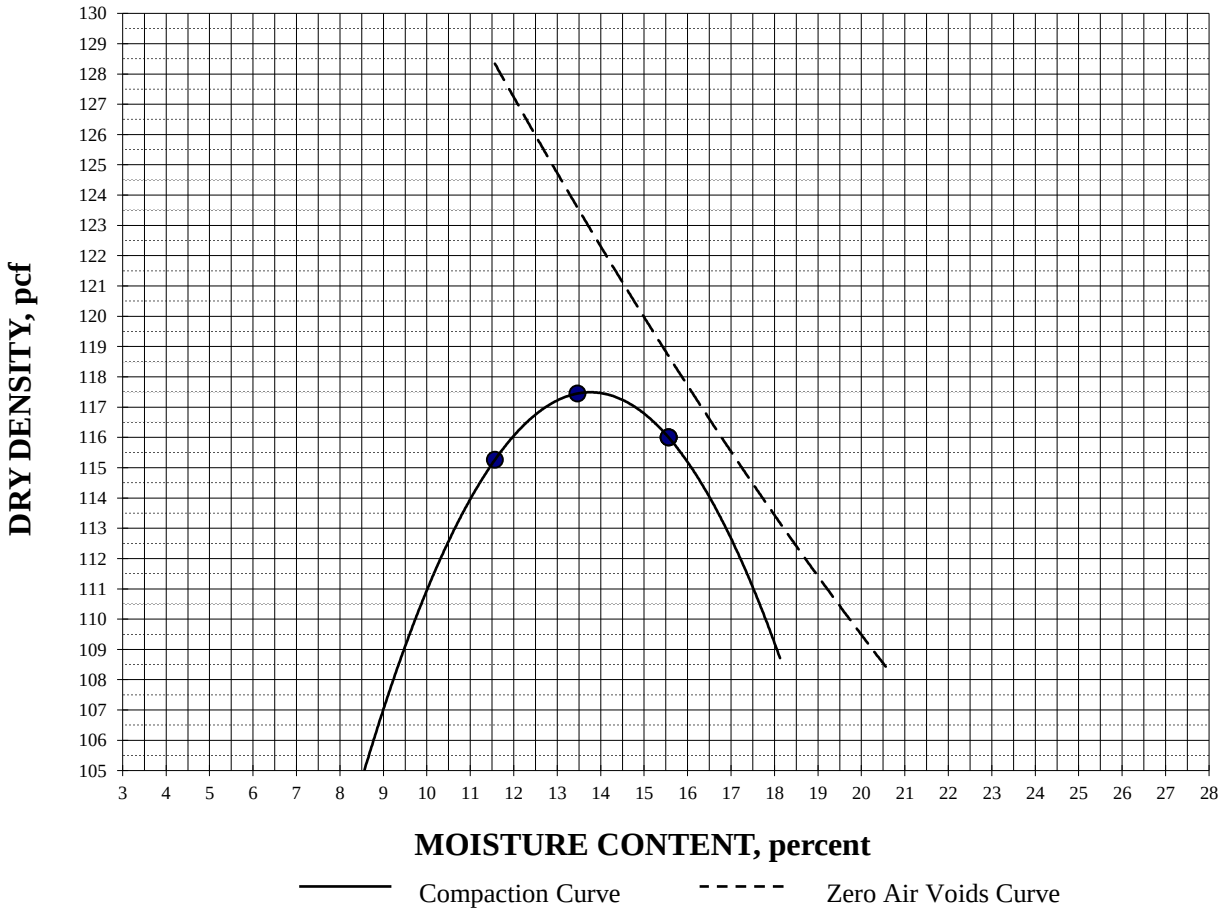
PROCEDURE USED: A
PREPARATION METHOD: Moist
RAMMER TYPE: Mechanical
SPECIFIC GRAVITY: 2.70 (assumed)

February 11, 2020
Boring #54 @ 4.0 - 5.0'
Dark Brown Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	1
#4	1

MAXIMUM DRY DENSITY: 117.5 pcf
OPTIMUM MOISTURE: 13.8%



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

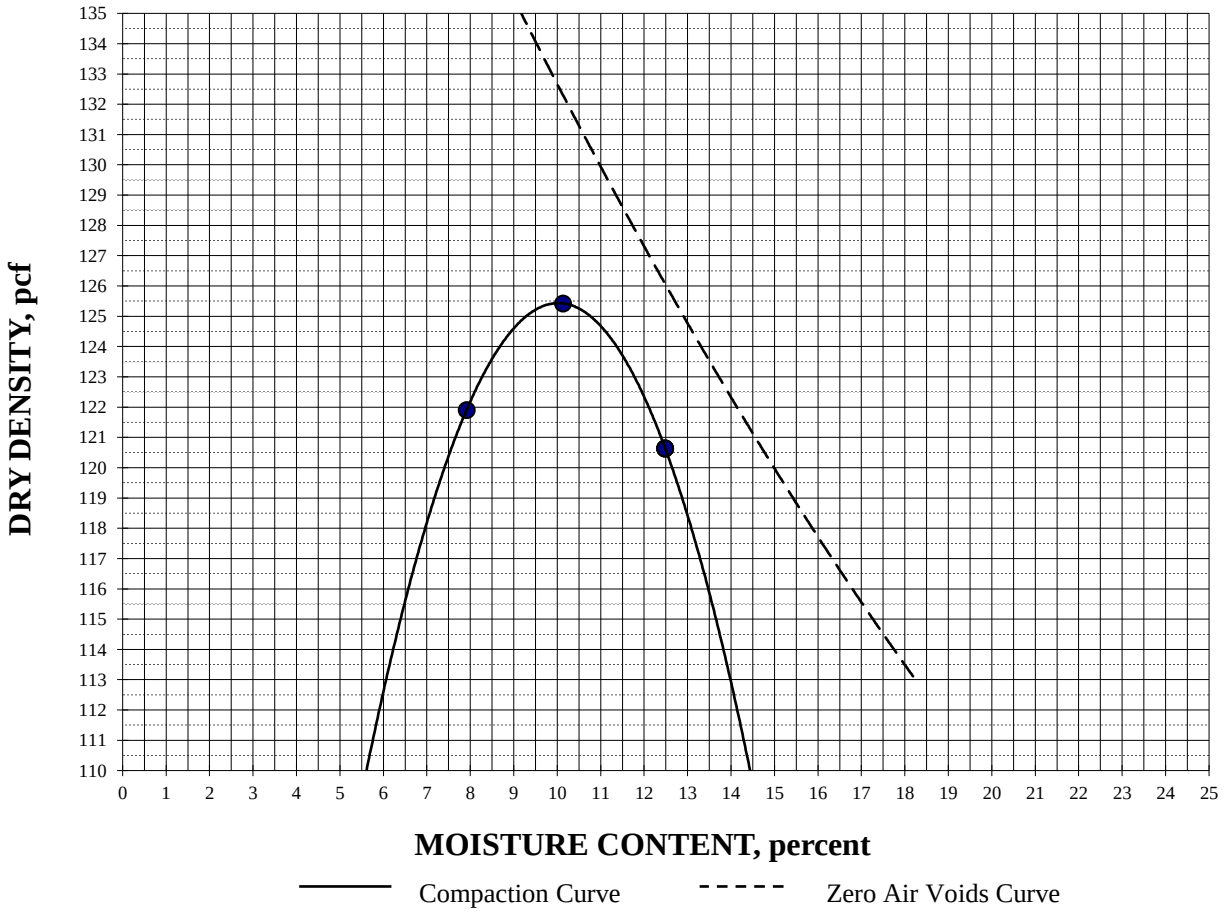
PROCEDURE USED: A
PREPARATION METHOD: Moist
RAMMER TYPE: Mechanical
SPECIFIC GRAVITY: 2.70 (assumed)

February 11, 2020
Boring #55 @ 1.5 - 5.0'
Dark Brown Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	0
#4	1

MAXIMUM DRY DENSITY: 125.4 pcf
OPTIMUM MOISTURE: 10.0%



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

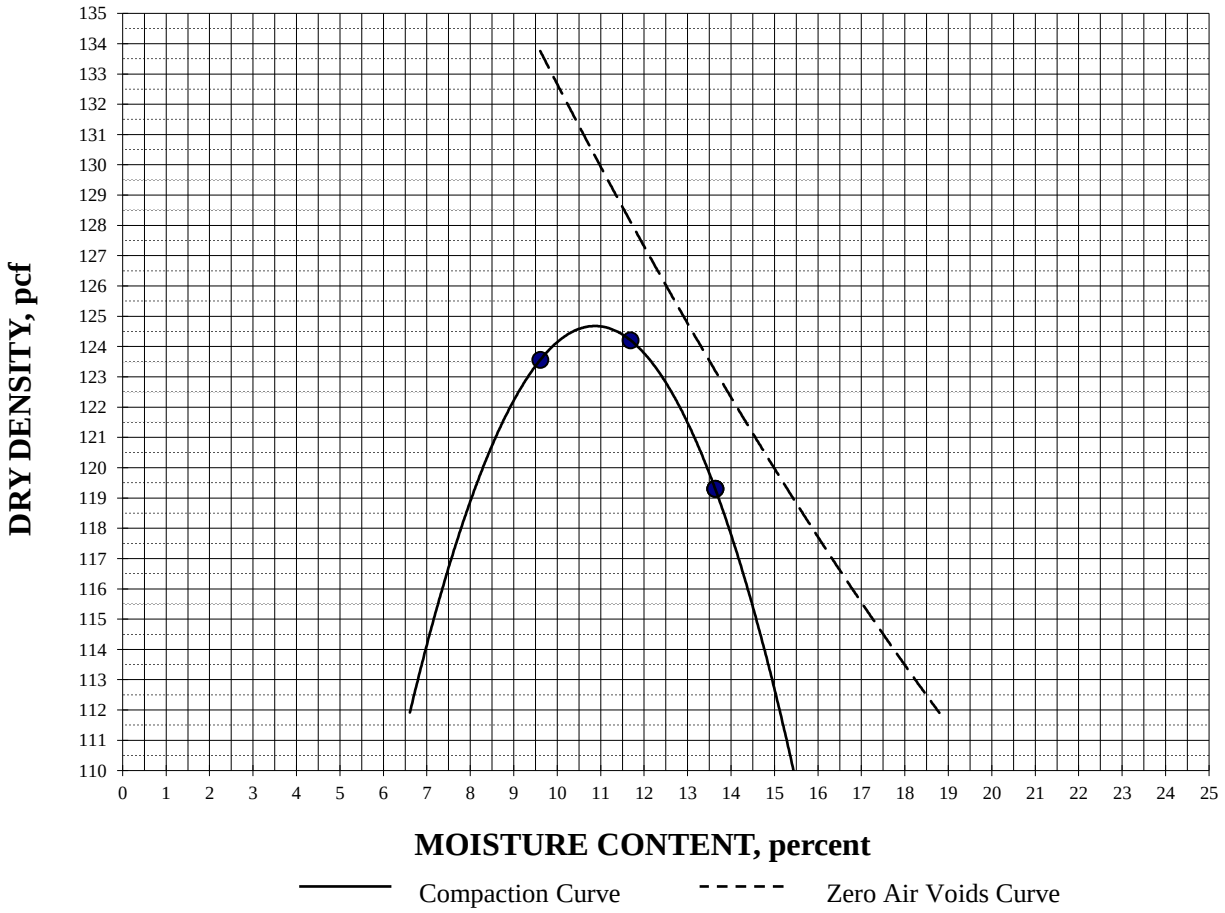
PROCEDURE USED: A
PREPARATION METHOD: Moist
RAMMER TYPE: Mechanical
SPECIFIC GRAVITY: 2.70 (assumed)

February 11, 2020
Boring #62 @ 2.0 - 5.0'
Dark Brown Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	1
#4	2

MAXIMUM DRY DENSITY: 124.7 pcf
OPTIMUM MOISTURE: 10.9%



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

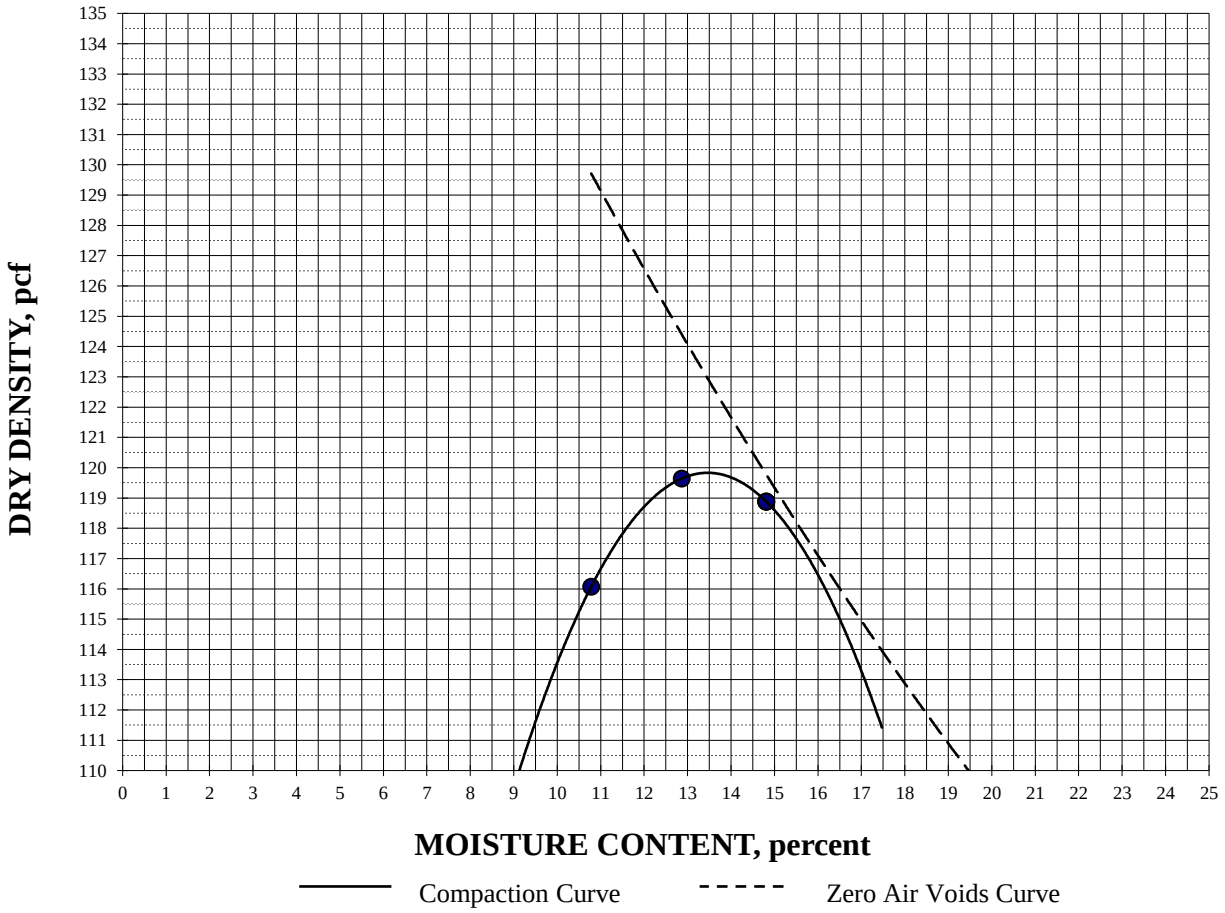
PROCEDURE USED: A
PREPARATION METHOD: Moist
RAMMER TYPE: Mechanical
SPECIFIC GRAVITY: 2.68 (assumed)

February 11, 2020
Boring #66 @ 4.0 - 5.0'
Dark Brown Silty, Clayey Sand (SC-SM)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	1
#4	3

MAXIMUM DRY DENSITY: 119.8 pcf
OPTIMUM MOISTURE: 13.5%



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

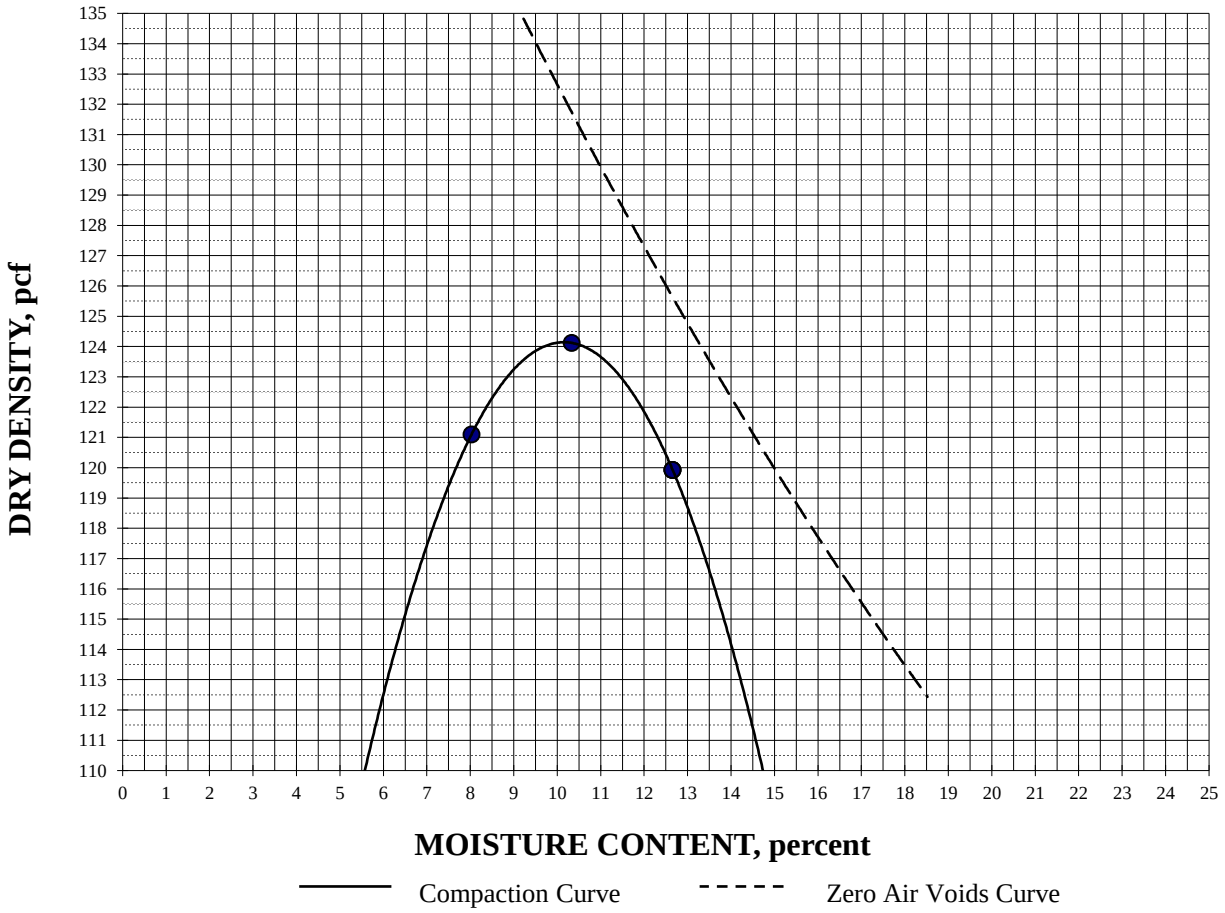
PROCEDURE USED: A
PREPARATION METHOD: Moist
RAMMER TYPE: Mechanical
SPECIFIC GRAVITY: 2.70 (assumed)

February 11, 2020
Boring #70 @ 1.5 - 4.5'
Dark Brown Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	0
#4	1

MAXIMUM DRY DENSITY: 124.1 pcf
OPTIMUM MOISTURE: 10.2%



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #41 @ 1.5 - 5.0'
Dark Brown Sandy Lean Clay (CL)

February 11, 2020

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	101.9	106.5	111.6
Moisture content, %, before soak	8.5	11.5	14.5
Moisture content, %, after soak, avg.	21.5	18.4	15.6
Moisture content, %, after soak, top 1"	22.1	21.5	18.2
Expansion, %, 96 hour soak	0.0	0.0	0.0
Bearing Ratio, 0.100" penetration	2.7	5.1	7.0

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	110.0	110.5	116.1
Moisture content, %, before soak	8.5	11.5	14.5
Moisture content, %, after soak, avg.	19.1	15.9	16.3
Moisture content, %, after soak, top 1"	20.3	21.0	16.8
Expansion, %, 96 hour soak	0.0	0.2	0.0
Bearing Ratio, 0.100" penetration	5.1	6.6	10.1

75 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	119.9	121.4	118.3
Moisture content, %, before soak	8.5	11.5	14.5
Moisture content, %, after soak, avg.	15.7	15.0	16.4
Moisture content, %, after soak, top 1"	20.0	17.8	16.5
Expansion, %, 96 hour soak	0.2	0.5	0.0
Bearing Ratio, 0.100" penetration	10.3	20.3	10.4

Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

MOISTURE-DENSITY COMPACTION TEST

ASTM D 1557-12 (Modified)

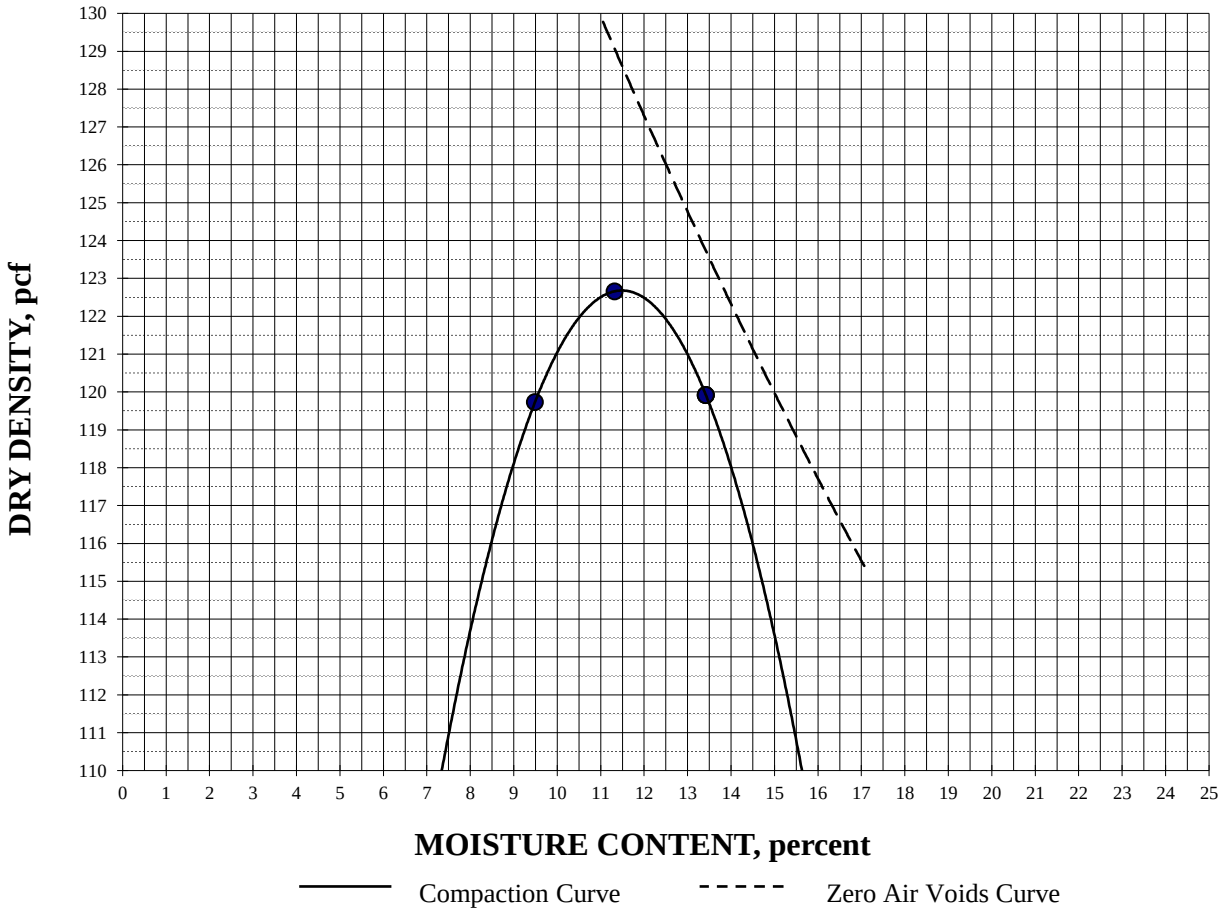
PROCEDURE USED: A
PREPARATION METHOD: Moist
RAMMER TYPE: Mechanical
SPECIFIC GRAVITY: 2.70 (assumed)

February 11, 2020
Boring #41 @ 1.5 - 5.0'
Dark Brown Sandy Lean Clay (CL)

SIEVE DATA:

Sieve Size	% Retained (Cumulative)
3/4"	0
3/8"	1
#4	2

MAXIMUM DRY DENSITY: 122.7 pcf
OPTIMUM MOISTURE: 11.5%



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

CALIFORNIA BEARING RATIO

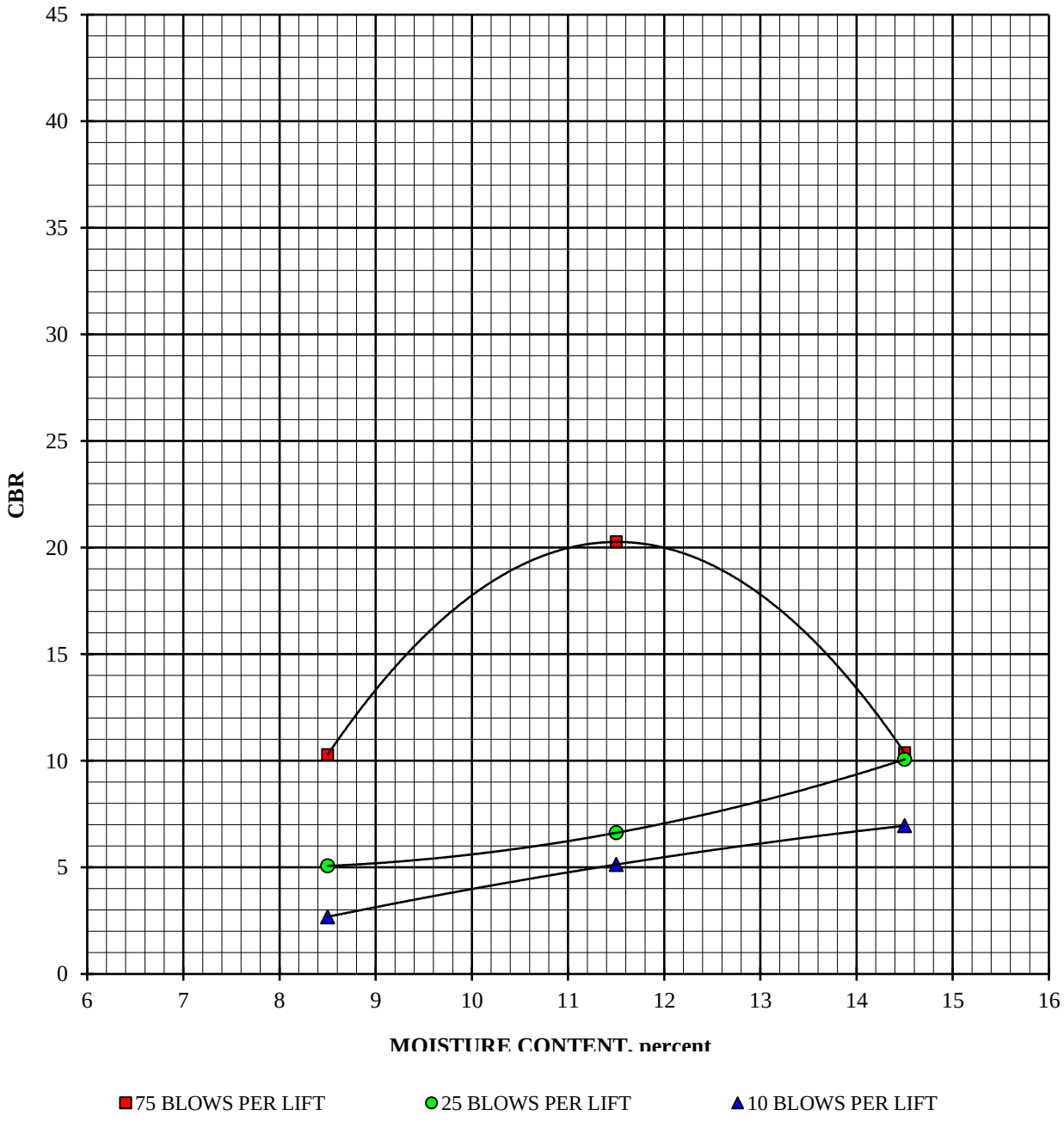
ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #41 @ 1.5 - 5.0'

February 11, 2020

Dark Brown Sandy Lean Clay (CL)

CBR vs. MOISTURE CONTENT



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

CALIFORNIA BEARING RATIO

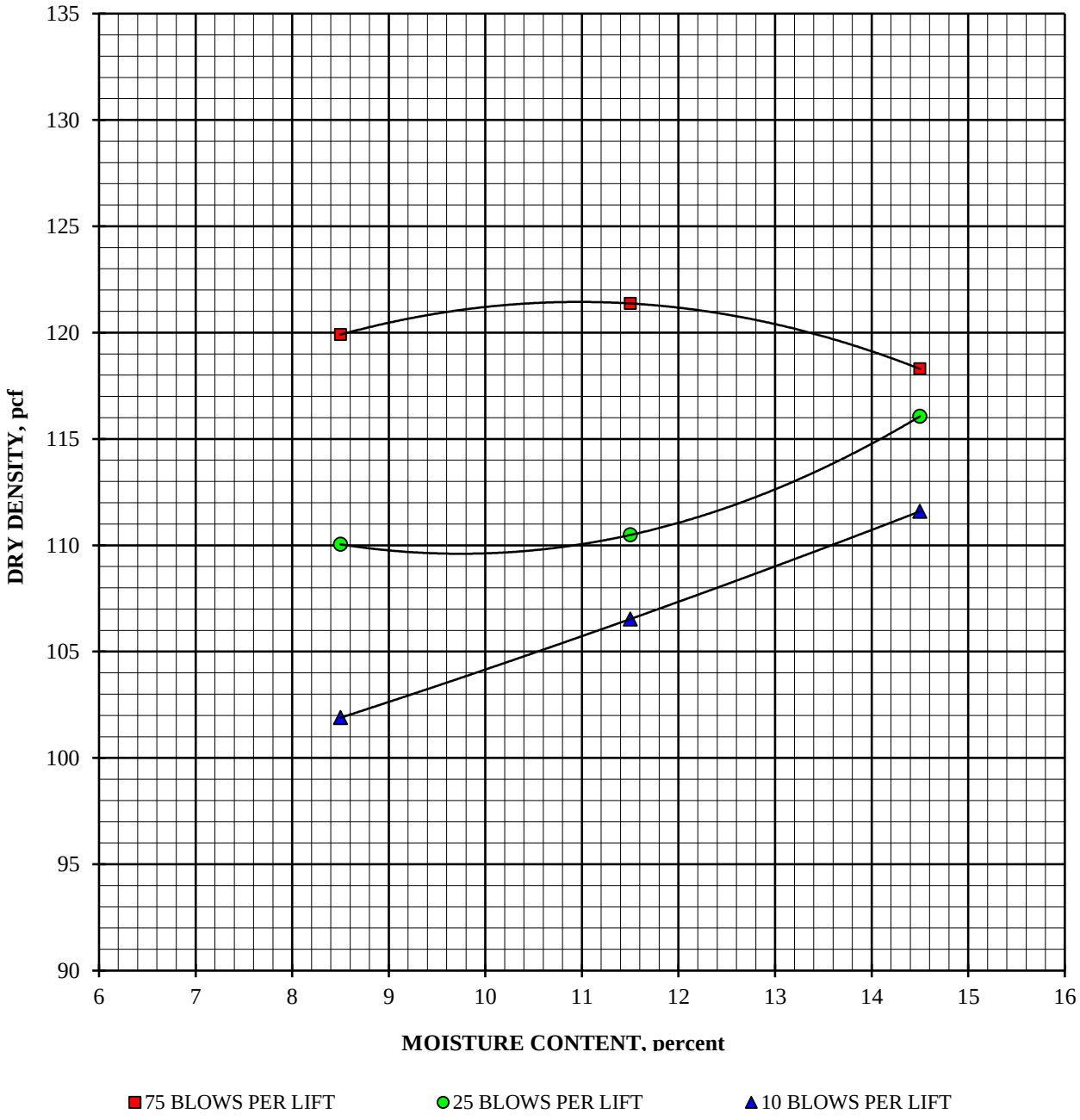
ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #41 @ 1.5 - 5.0'

February 11, 2020

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

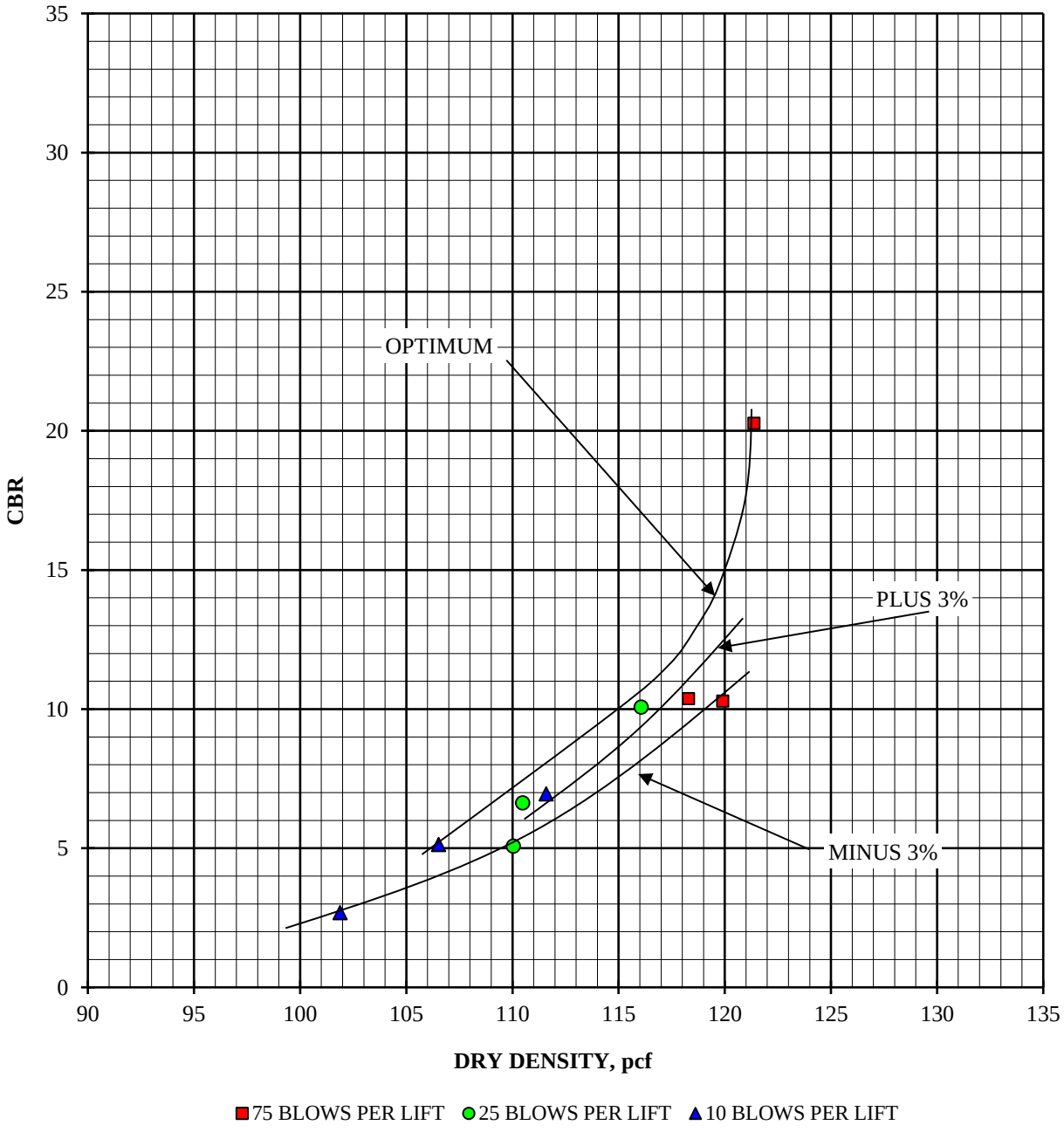
Boring #41 @ 1.5 - 5.0'

February 11, 2020

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport Taxiway F Improvements 302524-002
Oxnard, California

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #45 @ 1.0 - 5.0' February 11, 2020
Dark Brown Sandy Lean Clay (CL) With 5% Lime by Dry Weight

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak			104.5
Moisture content, %, before soak			14.3
Moisture content, %, after soak, avg.			17.2
Moisture content, %, after soak, top 1"			16.4
Expansion, %, 96 hour soak			0.1
Bearing Ratio, 0.100" penetration			22.6

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak			111.3
Moisture content, %, before soak			14.3
Moisture content, %, after soak, avg.			17.2
Moisture content, %, after soak, top 1"			18.3
Expansion, %, 96 hour soak			0.0
Bearing Ratio, 0.100" penetration			57.7

75 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak			116.4
Moisture content, %, before soak			14.3
Moisture content, %, after soak, avg.			15.2
Moisture content, %, after soak, top 1"			22.0
Expansion, %, 96 hour soak			0.3
Bearing Ratio, 0.100" penetration			72.5

Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

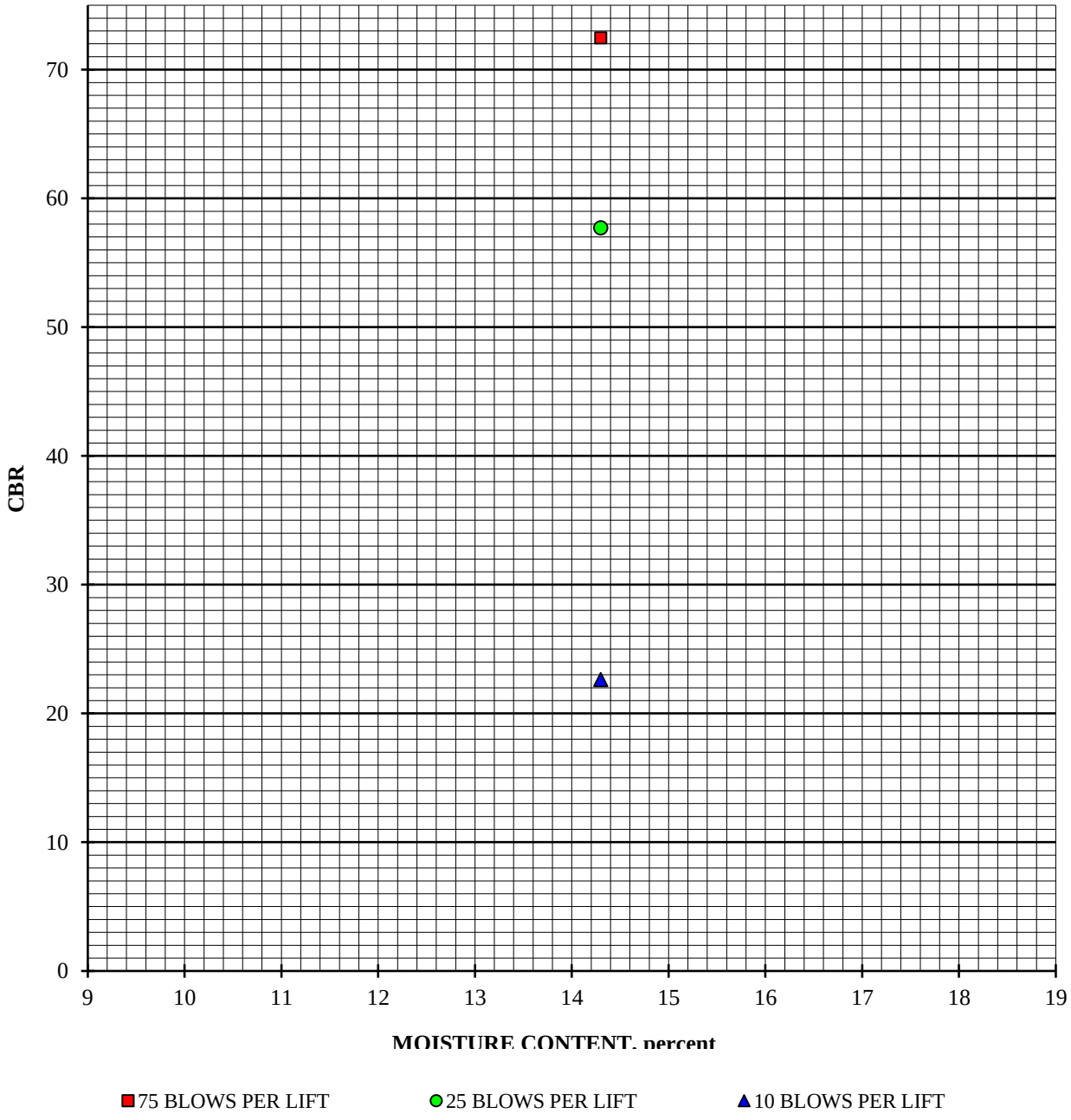
Boring #45 @ 1.0 - 5.0'

February 11, 2020

Dark Brown Sandy Lean Clay (CL)

With 5% Lime by Dry Weight

CBR vs. MOISTURE CONTENT



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

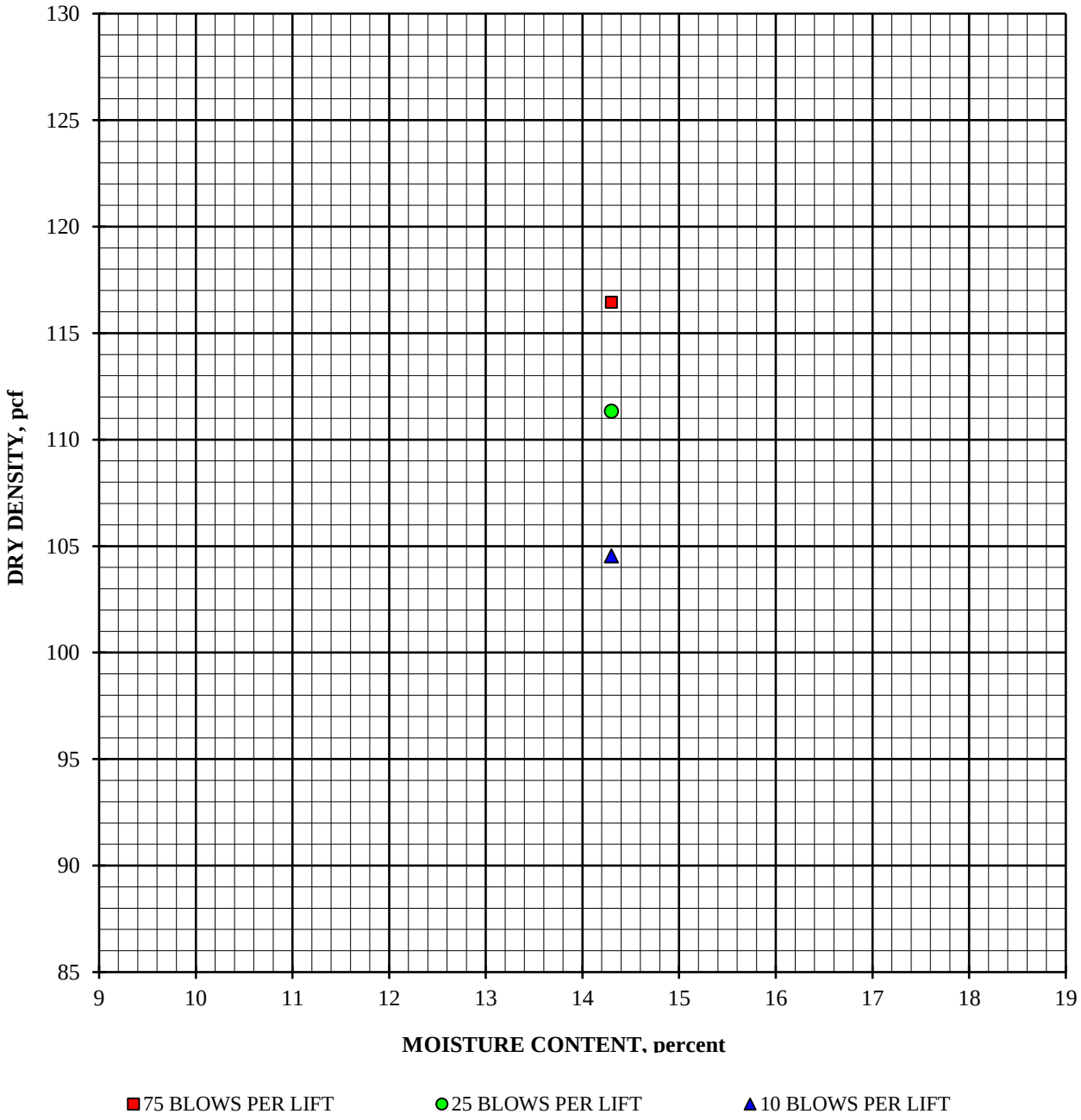
Boring #45 @ 1.0 - 5.0'

February 11, 2020

Dark Brown Sandy Lean Clay (CL)

With 5% Lime by Dry Weight

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #45 @ 1.0 - 5.0'

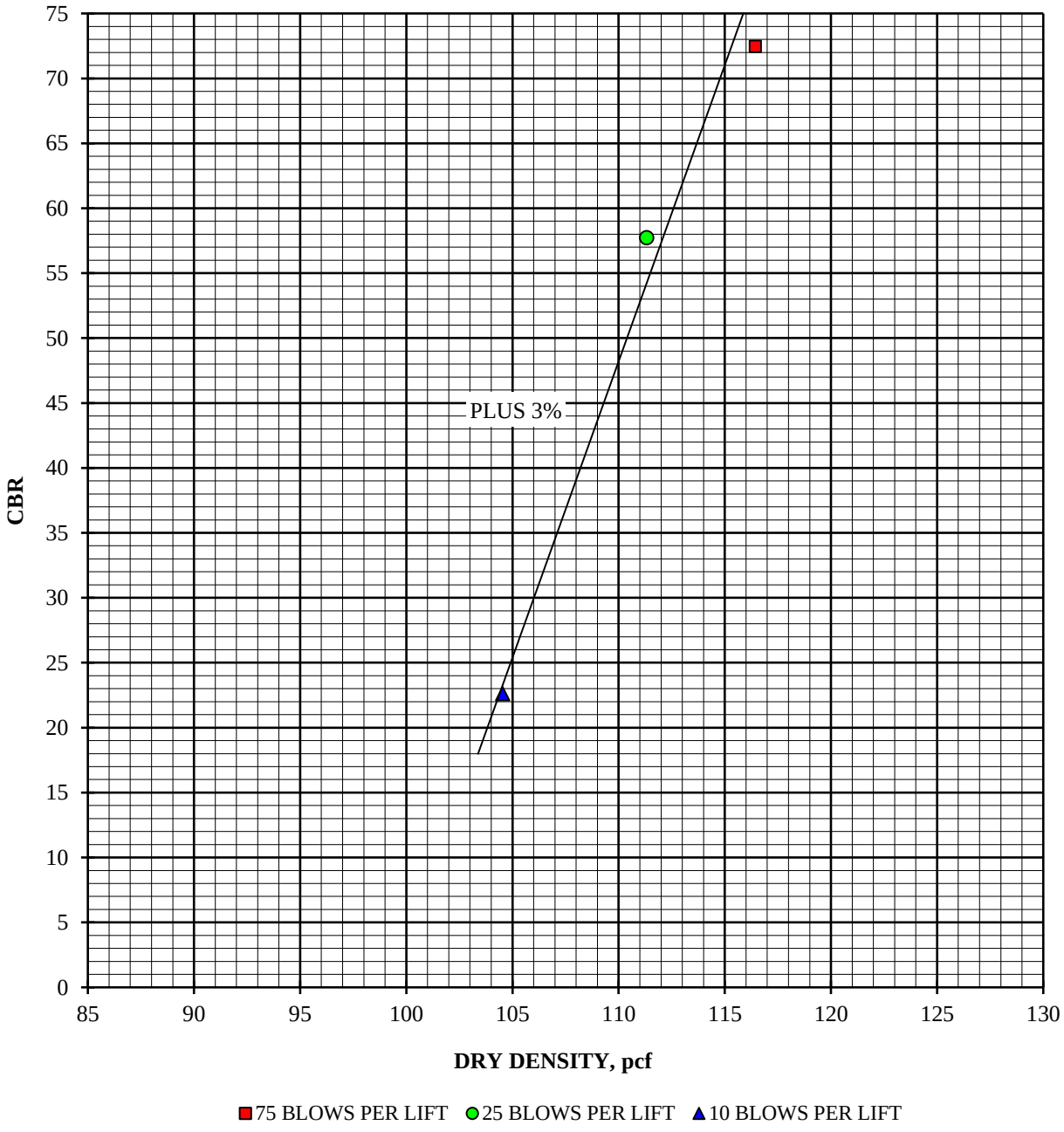
February 11, 2020

Dark Brown Sandy Lean Clay (CL)

With 5% Lime by Dry Weight

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #46 @ 1.0 - 2.0'
Light Brown Well-Graded Sand with Silt and Gravel (SW-SM)

February 11, 2020

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	112.6	120.2	118.6
Moisture content, %, before soak	5.3	8.3	11.3
Moisture content, %, after soak, avg.	9.9	10.0	13.8
Moisture content, %, after soak, top 1"	13.2	11.6	13.1
Expansion, %, 96 hour soak	0.3	0.9	0.2
Bearing Ratio, 0.100" penetration	9.8	32.5	23.0

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	117.3	123.9	121.8
Moisture content, %, before soak	5.3	8.3	11.3
Moisture content, %, after soak, avg.	10.0	9.4	12.3
Moisture content, %, after soak, top 1"	12.1	10.0	11.0
Expansion, %, 96 hour soak	0.2	0.8	0.3
Bearing Ratio, 0.100" penetration	19.4	54.9	20.3

75 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	122.1	128.9	124.3
Moisture content, %, before soak	5.3	8.3	11.3
Moisture content, %, after soak, avg.	11.9	9.2	12.7
Moisture content, %, after soak, top 1"	10.5	8.8	10.9
Expansion, %, 96 hour soak	0.3	0.6	0.1
Bearing Ratio, 0.100" penetration	37.2	109.6	32.1

Oxnard Airport Taxiway F Improvements
Oxnard, California

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CALIFORNIA BEARING RATIO

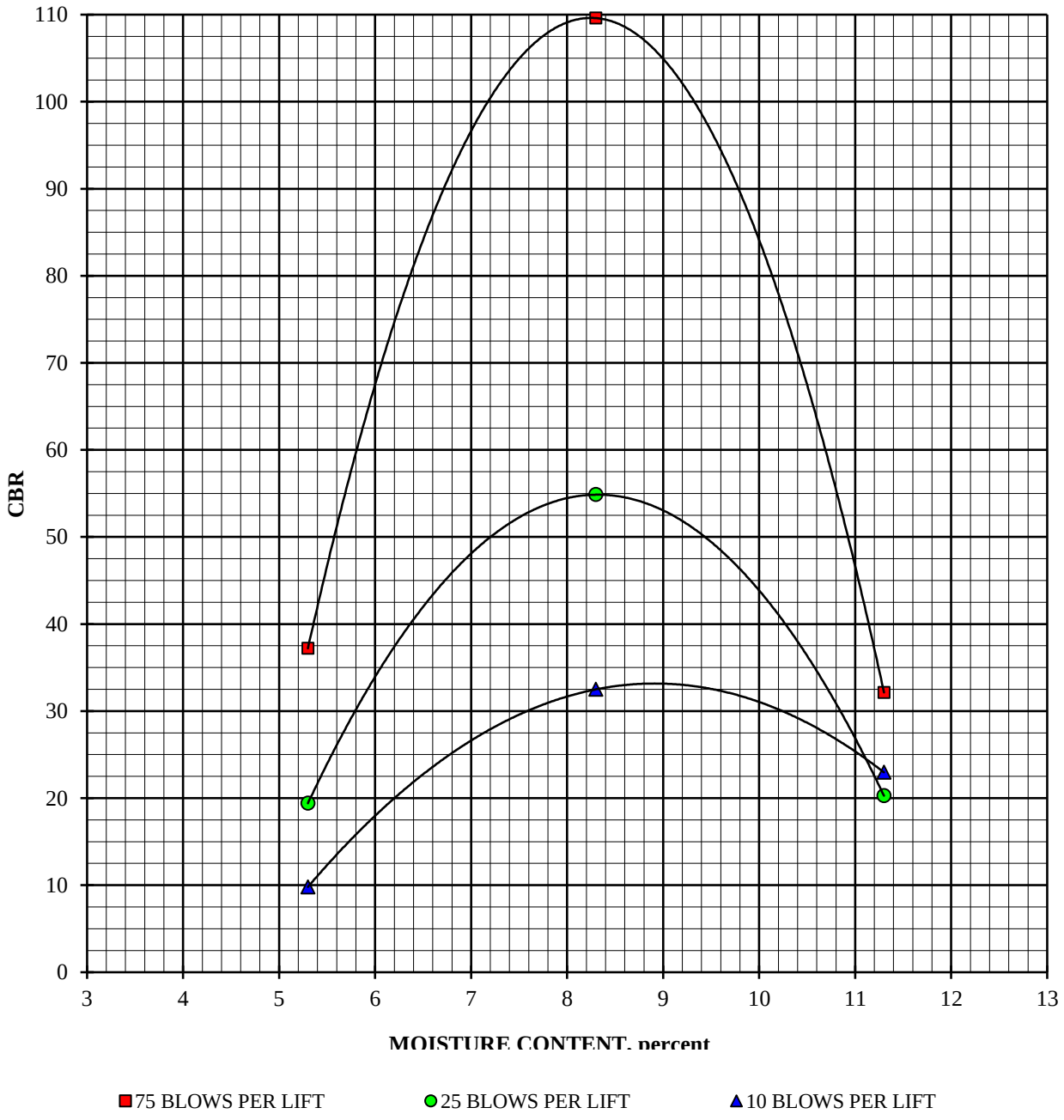
ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #46 @ 1.0 - 2.0'

February 11, 2020

Light Brown Well-Graded Sand with Silt and Gravel (SW-SM)

CBR vs. MOISTURE CONTENT



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

CALIFORNIA BEARING RATIO

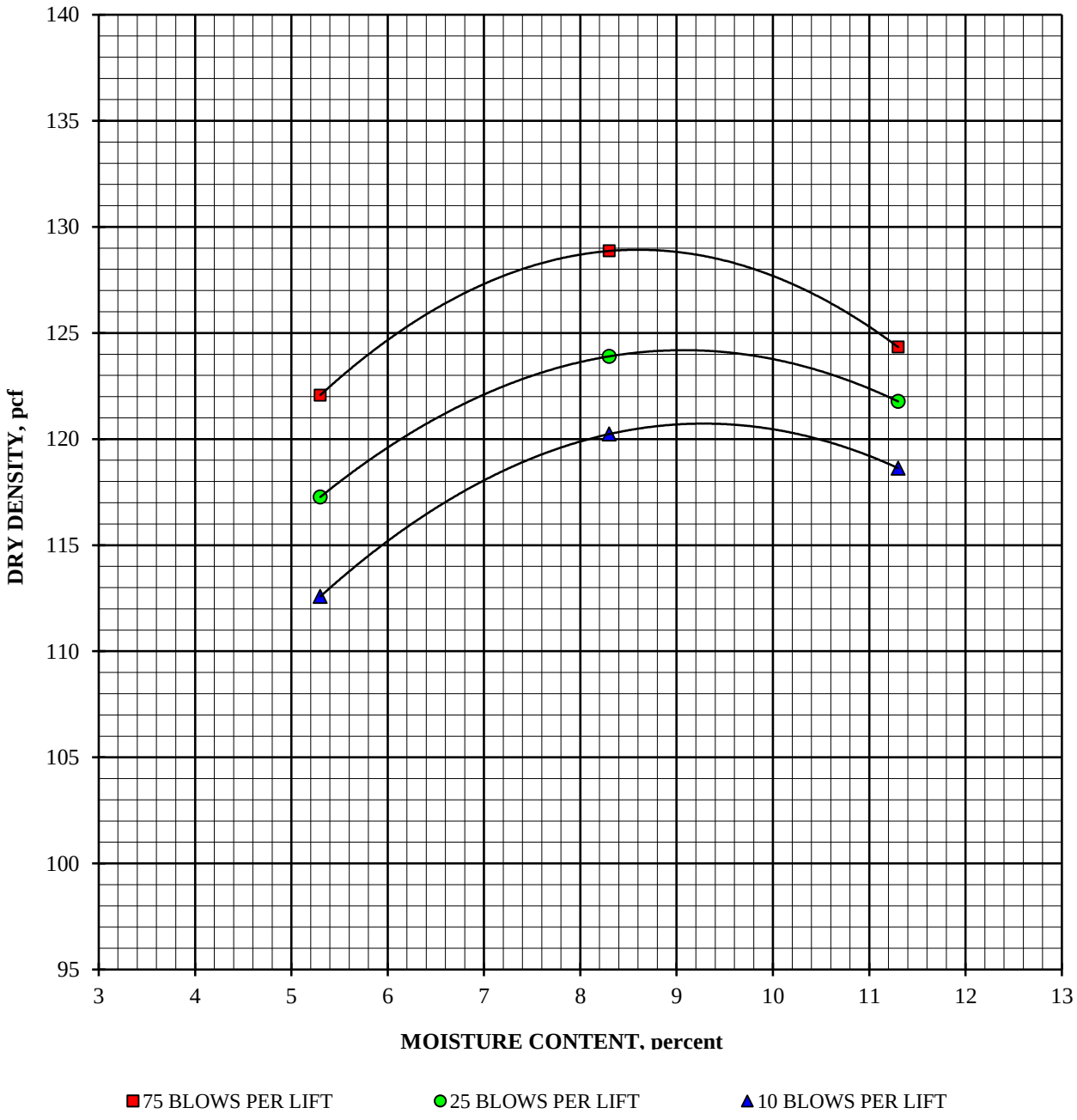
ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #46 @ 1.0 - 2.0'

February 11, 2020

Light Brown Well-Graded Sand with Silt and Gravel (SW-SM)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

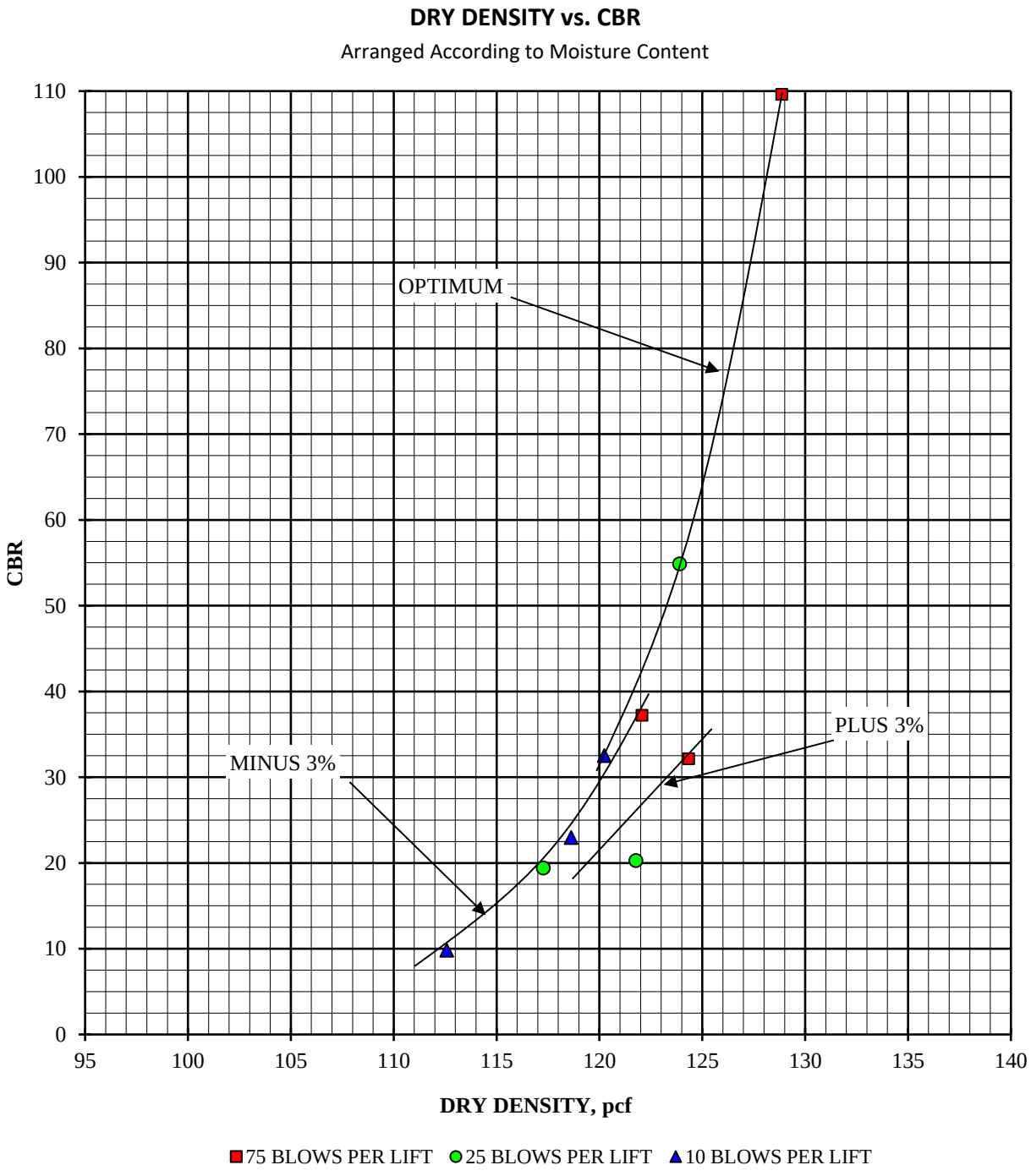
CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #46 @ 1.0 - 2.0'

February 11, 2020

Light Brown Well-Graded Sand with Silt and Gravel (SW-SM)



Oxnard Airport Taxiway F Improvements
Oxnard, California

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #54 @ 4.0 - 5.0'
Dark Brown Sandy Lean Clay (CL)

February 11, 2020

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	98.6	103.4	108.2
Moisture content, %, before soak	10.8	13.8	16.8
Moisture content, %, after soak, avg.	21.9	23.0	20.0
Moisture content, %, after soak, top 1"	23.6	25.4	24.3
Expansion, %, 96 hour soak	2.8	1.3	0.0
Bearing Ratio, 0.100" penetration	2.3	2.6	6.9

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	109.6	113.4	112.8
Moisture content, %, before soak	10.8	13.8	16.8
Moisture content, %, after soak, avg.	9.8	18.5	20.6
Moisture content, %, after soak, top 1"	23.5	23.2	20.9
Expansion, %, 96 hour soak	1.9	0.8	0.1
Bearing Ratio, 0.100" penetration	5.3	6.9	9.6

75 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	117.0	119.8	109.2
Moisture content, %, before soak	10.8	13.8	16.8
Moisture content, %, after soak, avg.	17.2	15.1	23.6
Moisture content, %, after soak, top 1"	26.7	21.0	20.3
Expansion, %, 96 hour soak	2.0	0.6	0.3
Bearing Ratio, 0.100" penetration	4.2	15.5	7.5

Oxnard Airport Taxiway F Improvements
Oxnard, California

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CALIFORNIA BEARING RATIO

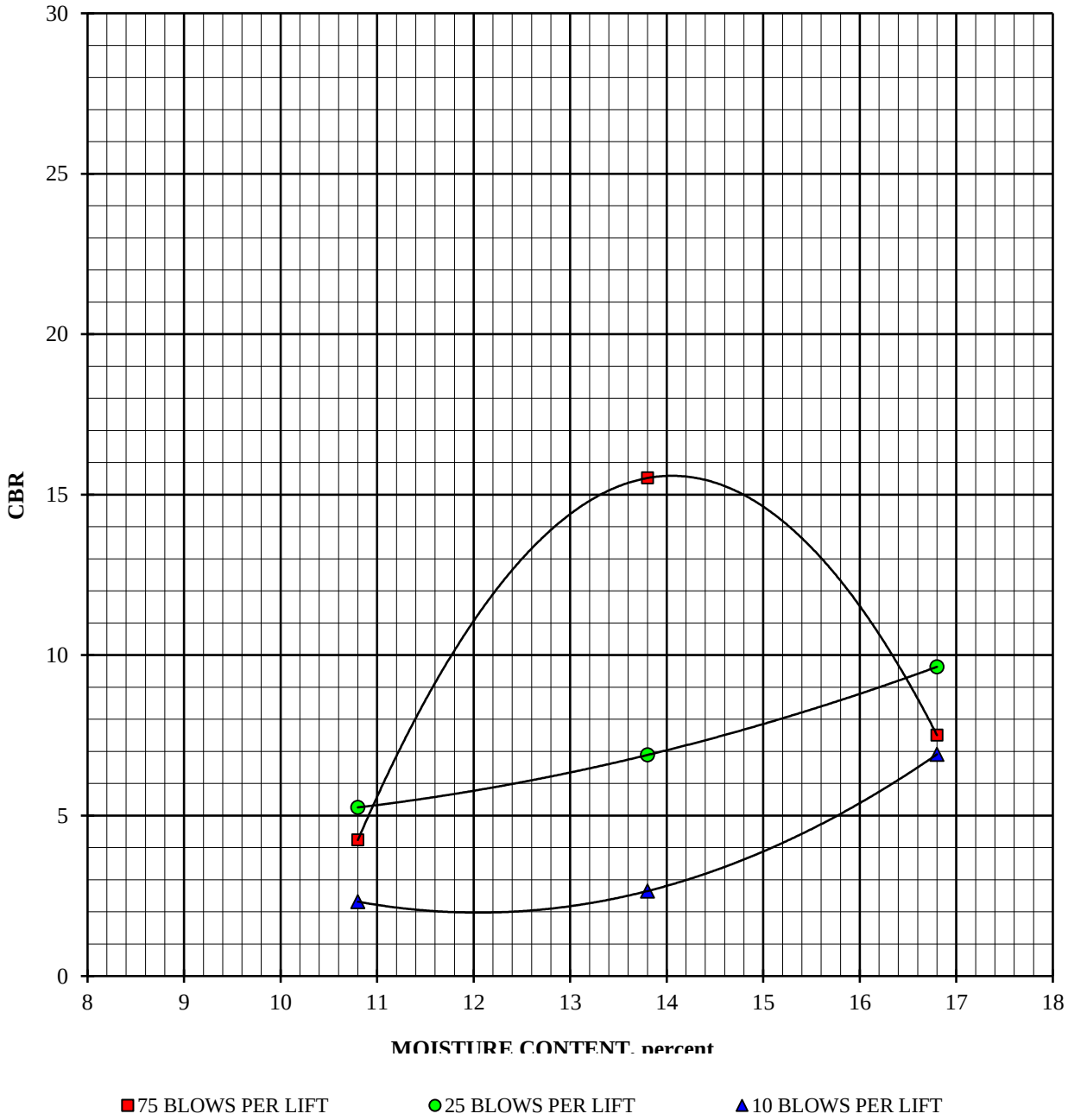
ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #54 @ 4.0 - 5.0'

February 11, 2020

Dark Brown Sandy Lean Clay (CL)

CBR vs. MOISTURE CONTENT



Oxnard Airport Taxiway F Improvements
Oxnard, California

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CALIFORNIA BEARING RATIO

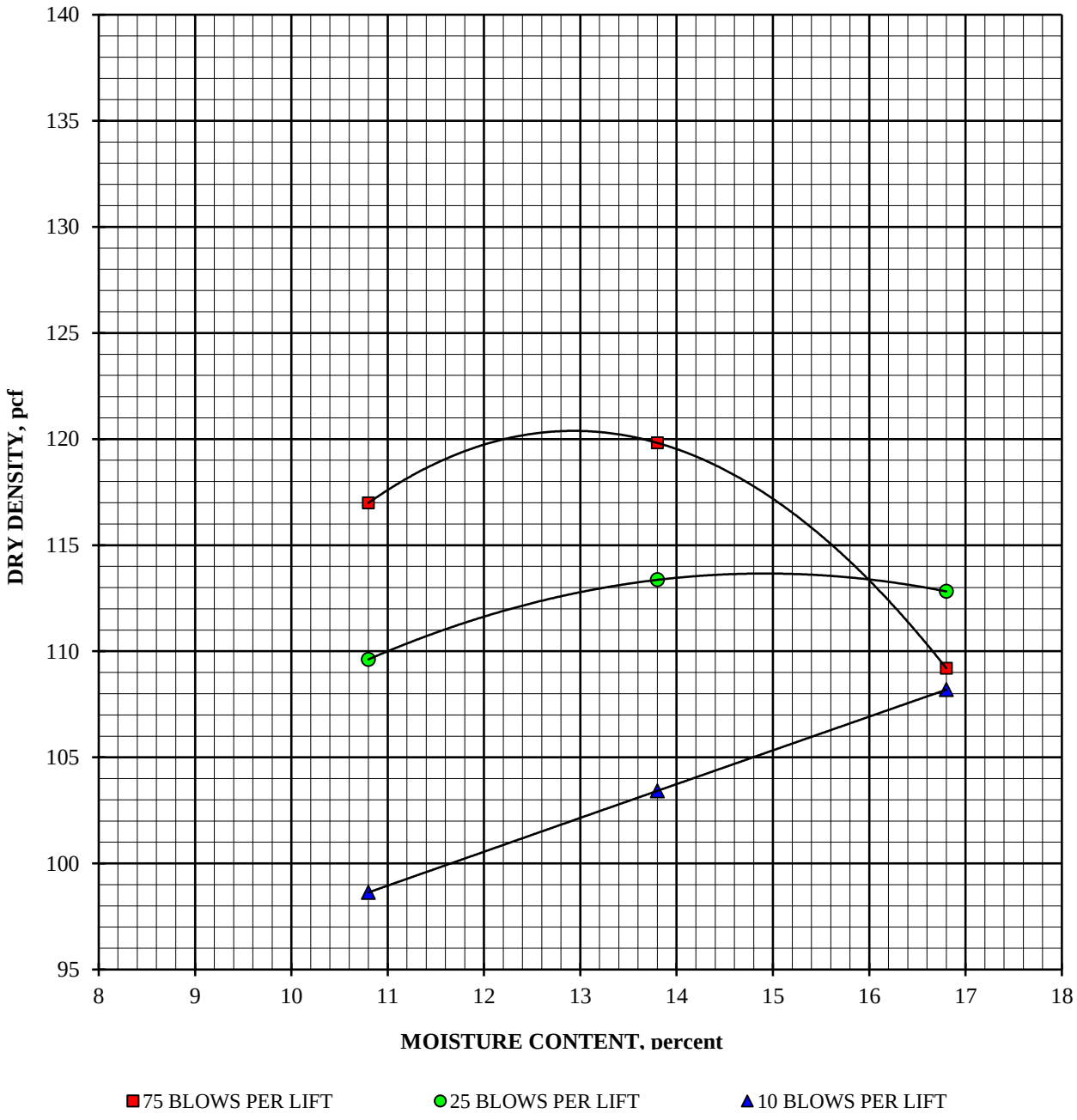
ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #54 @ 4.0 - 5.0'

February 11, 2020

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport Taxiway F Improvements
Oxnard, California

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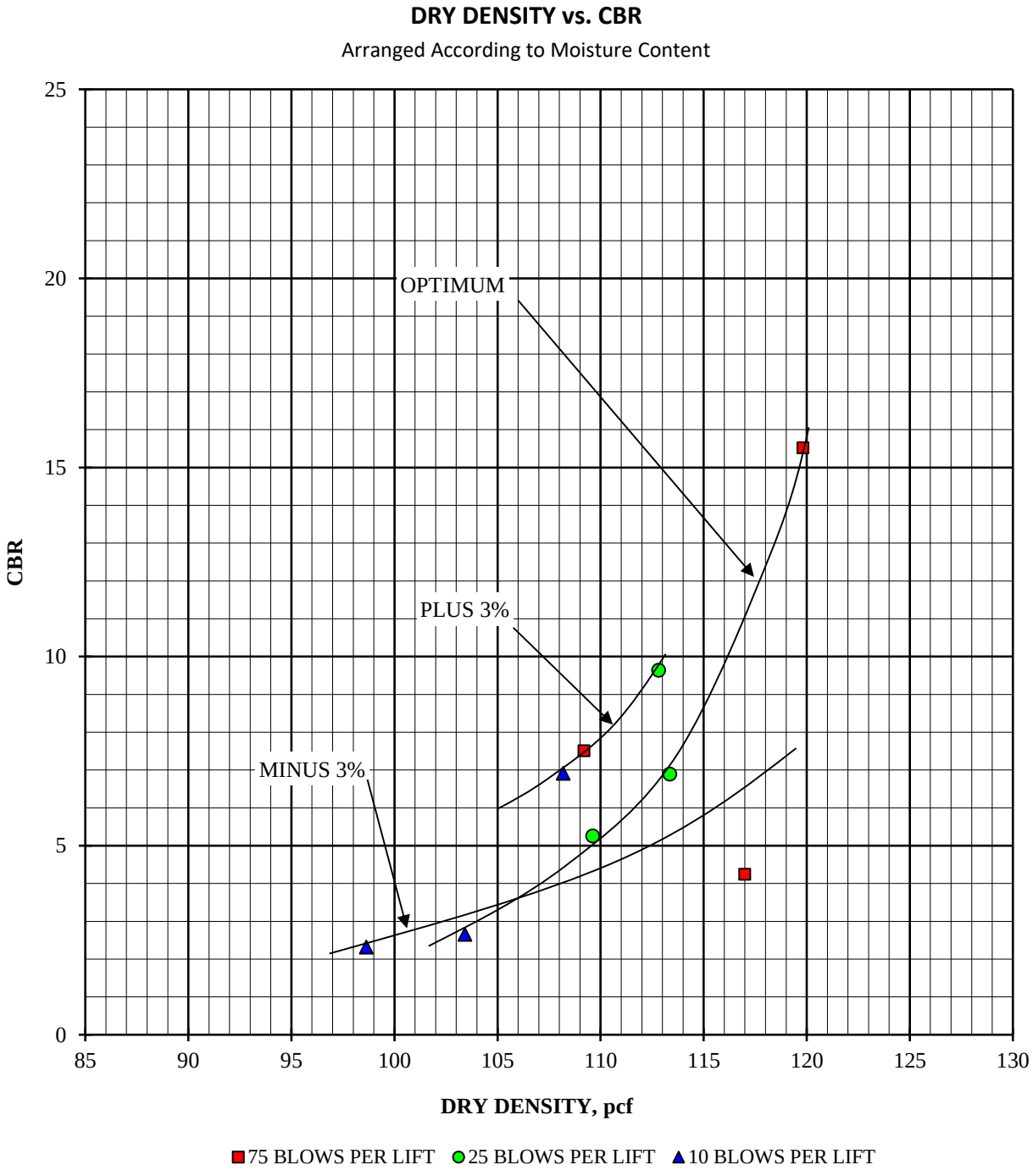
CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #54 @ 4.0 - 5.0'

February 11, 2020

Dark Brown Sandy Lean Clay (CL)



Oxnard Airport Taxiway F Improvements
Oxnard, California

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #55 @ 1.5 - 5.0'
Dark Brown Sandy Lean Clay (CL)

February 11, 2020

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	107.0	114.1	111.1
Moisture content, %, before soak	7.0	10.0	13.0
Moisture content, %, after soak, avg.	18.3	11.4	15.3
Moisture content, %, after soak, top 1"	20.1	15.0	15.1
Expansion, %, 96 hour soak	0.3	0.2	0.0
Bearing Ratio, 0.100" penetration	2.7	9.3	5.0

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	115.5	122.5	117.7
Moisture content, %, before soak	7.0	10.0	13.0
Moisture content, %, after soak, avg.	10.7	11.3	13.8
Moisture content, %, after soak, top 1"	19.2	17.2	14.5
Expansion, %, 96 hour soak	0.2	0.2	0.1
Bearing Ratio, 0.100" penetration	6.2	14.1	6.0

75 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	124.4	125.5	117.5
Moisture content, %, before soak	7.0	10.0	13.0
Moisture content, %, after soak, avg.	10.7	10.1	13.7
Moisture content, %, after soak, top 1"	16.2	15.6	13.3
Expansion, %, 96 hour soak	0.1	0.2	0.1
Bearing Ratio, 0.100" penetration	13.2	15.5	5.0

Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

CALIFORNIA BEARING RATIO

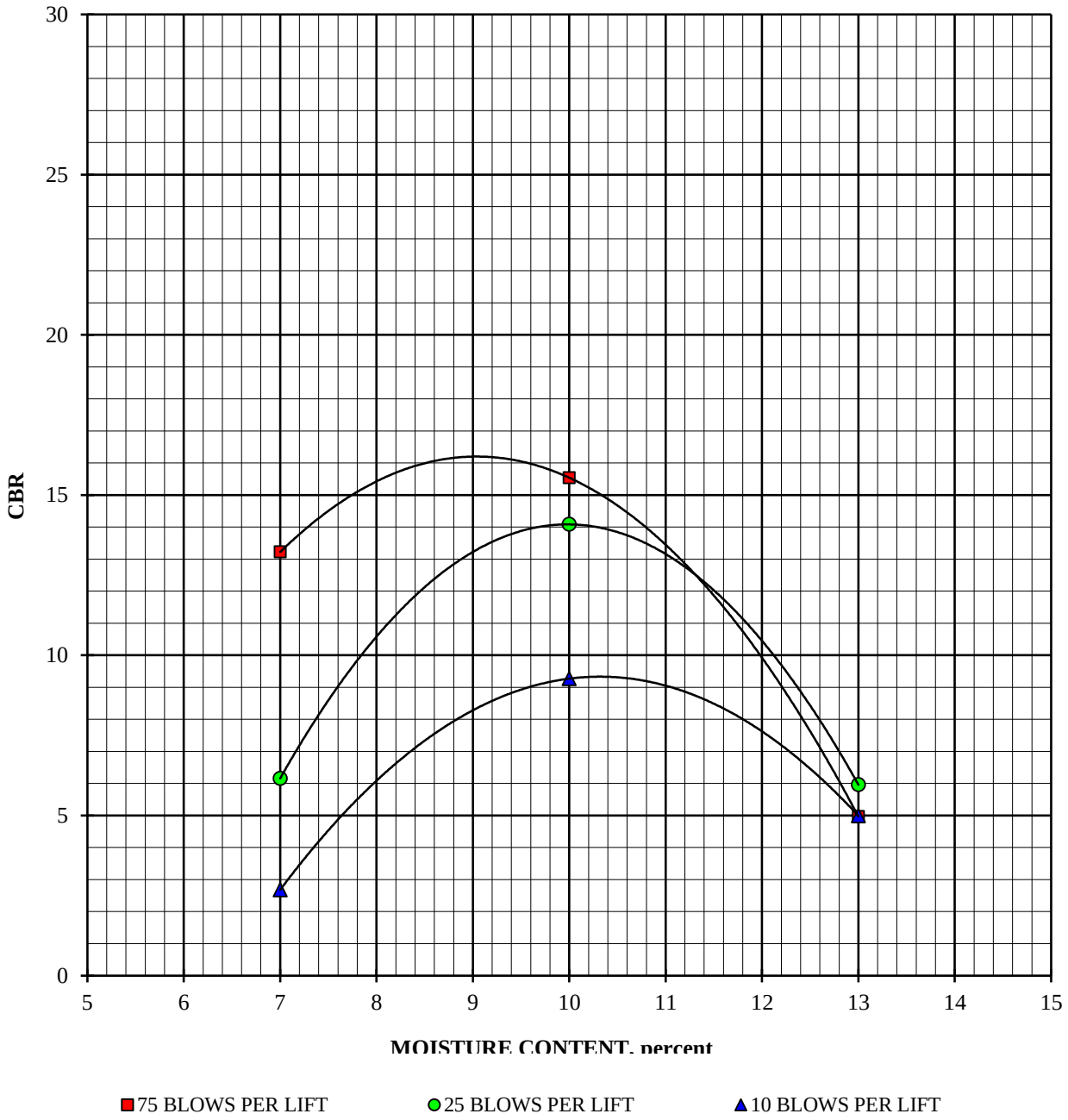
ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #55 @ 1.5 - 5.0'

February 11, 2020

Dark Brown Sandy Lean Clay (CL)

CBR vs. MOISTURE CONTENT



Oxnard Airport Taxiway F Improvements
Oxnard, California

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CALIFORNIA BEARING RATIO

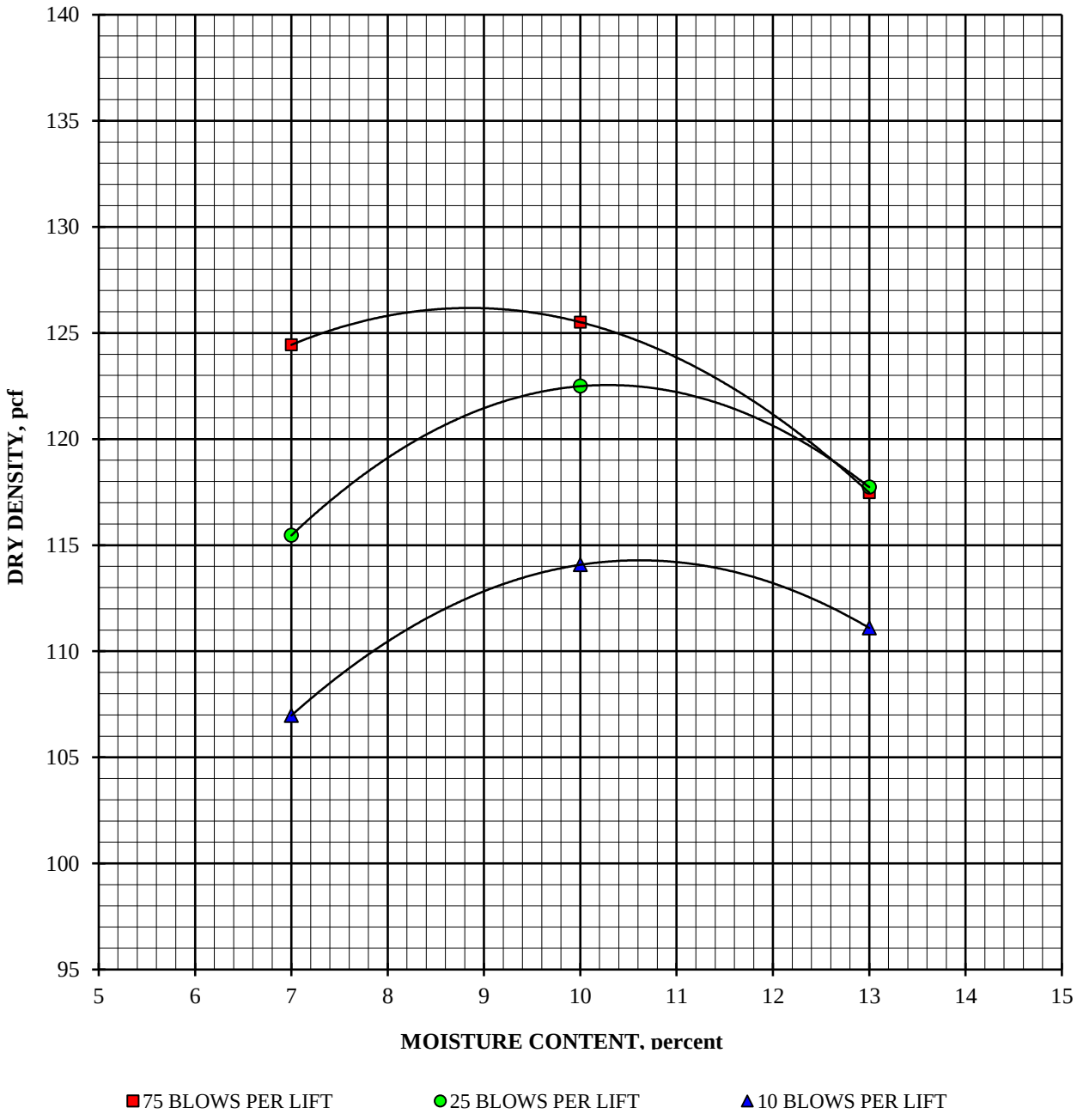
ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #55 @ 1.5 - 5.0'

February 11, 2020

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport Taxiway F Improvements
Oxnard, California

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

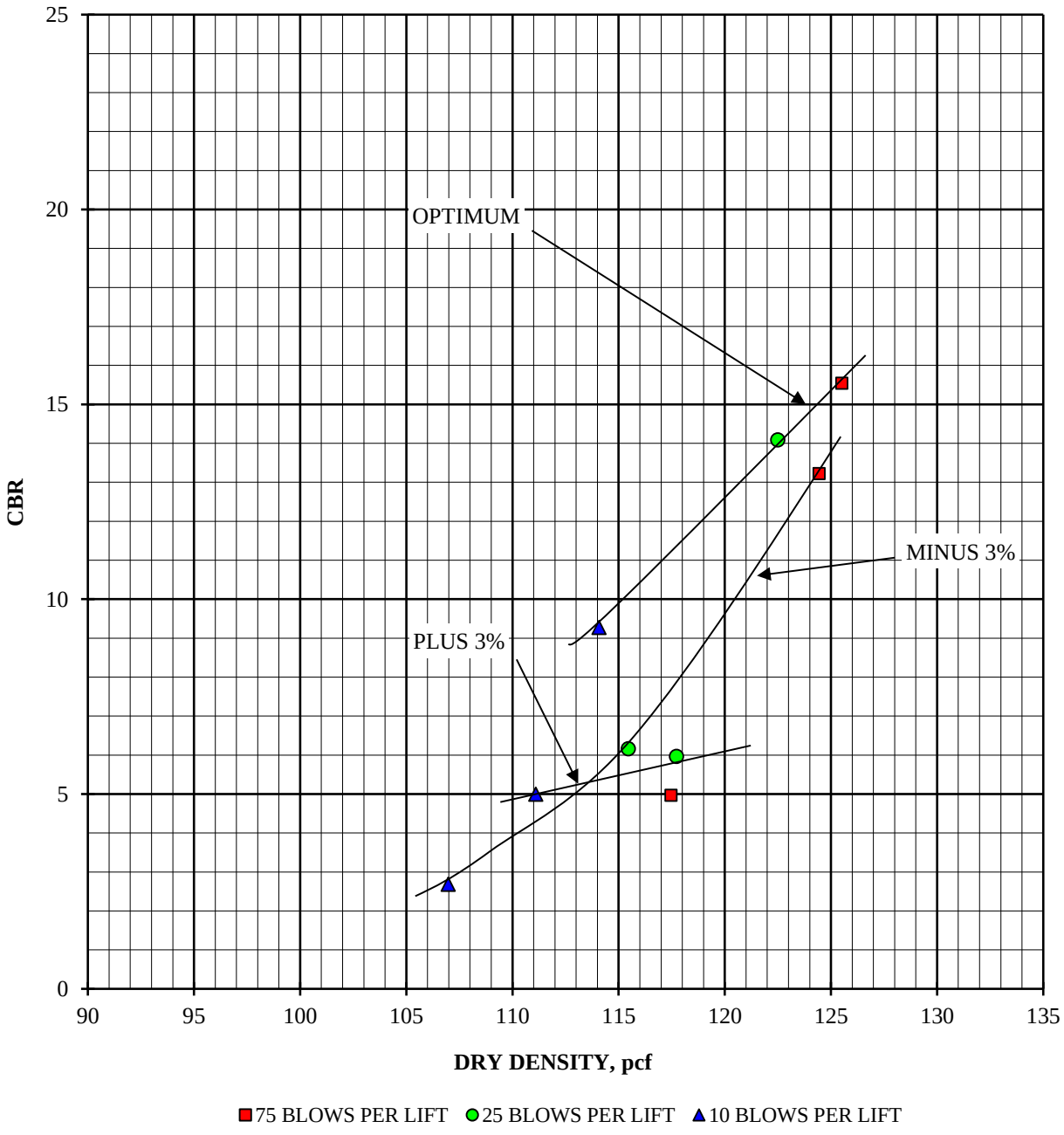
Boring #55 @ 1.5 - 5.0'

February 11, 2020

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



Oxnard Airport Taxiway F Improvements 302524-002
Oxnard, California

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #62 @ 2.0 - 5.0' February 11, 2020
Dark Brown Sandy Lean Clay (CL) With 5% Lime by Dry Weight

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak			105.2
Moisture content, %, before soak			13.9
Moisture content, %, after soak, avg.			19.0
Moisture content, %, after soak, top 1"			16.9
Expansion, %, 96 hour soak			0.0
Bearing Ratio, 0.100" penetration			38.8

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak			111.5
Moisture content, %, before soak			13.9
Moisture content, %, after soak, avg.			15.7
Moisture content, %, after soak, top 1"			17.2
Expansion, %, 96 hour soak			0.0
Bearing Ratio, 0.100" penetration			48.4

75 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak			114.6
Moisture content, %, before soak			13.9
Moisture content, %, after soak, avg.			15.2
Moisture content, %, after soak, top 1"			22.0
Expansion, %, 96 hour soak			1.2
Bearing Ratio, 0.100" penetration			58.1

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

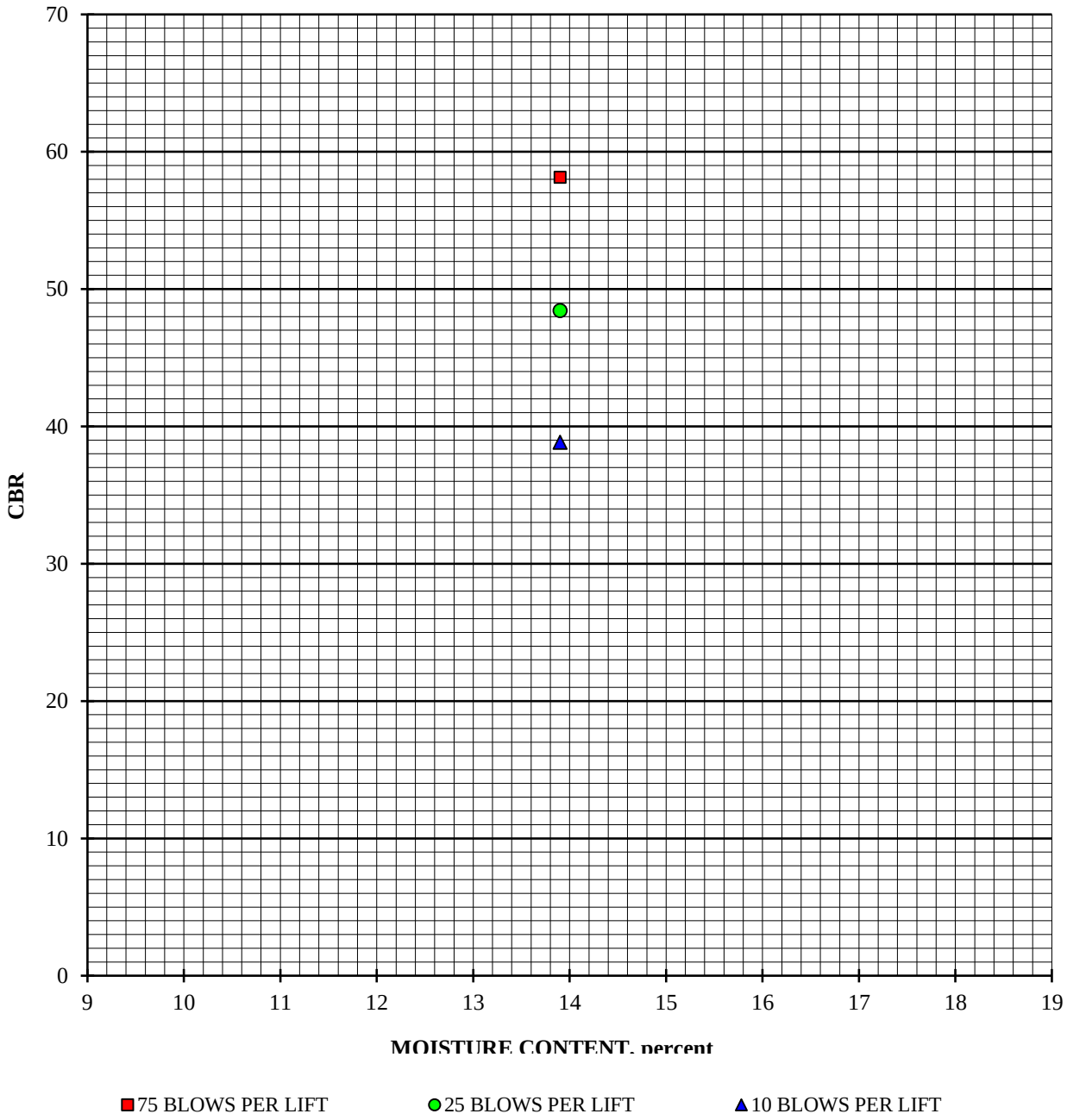
Boring #62 @ 2.0 - 5.0'

February 11, 2020

Dark Brown Sandy Lean Clay (CL)

With 5% Lime by Dry Weight

CBR vs. MOISTURE CONTENT



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CALIFORNIA BEARING RATIO

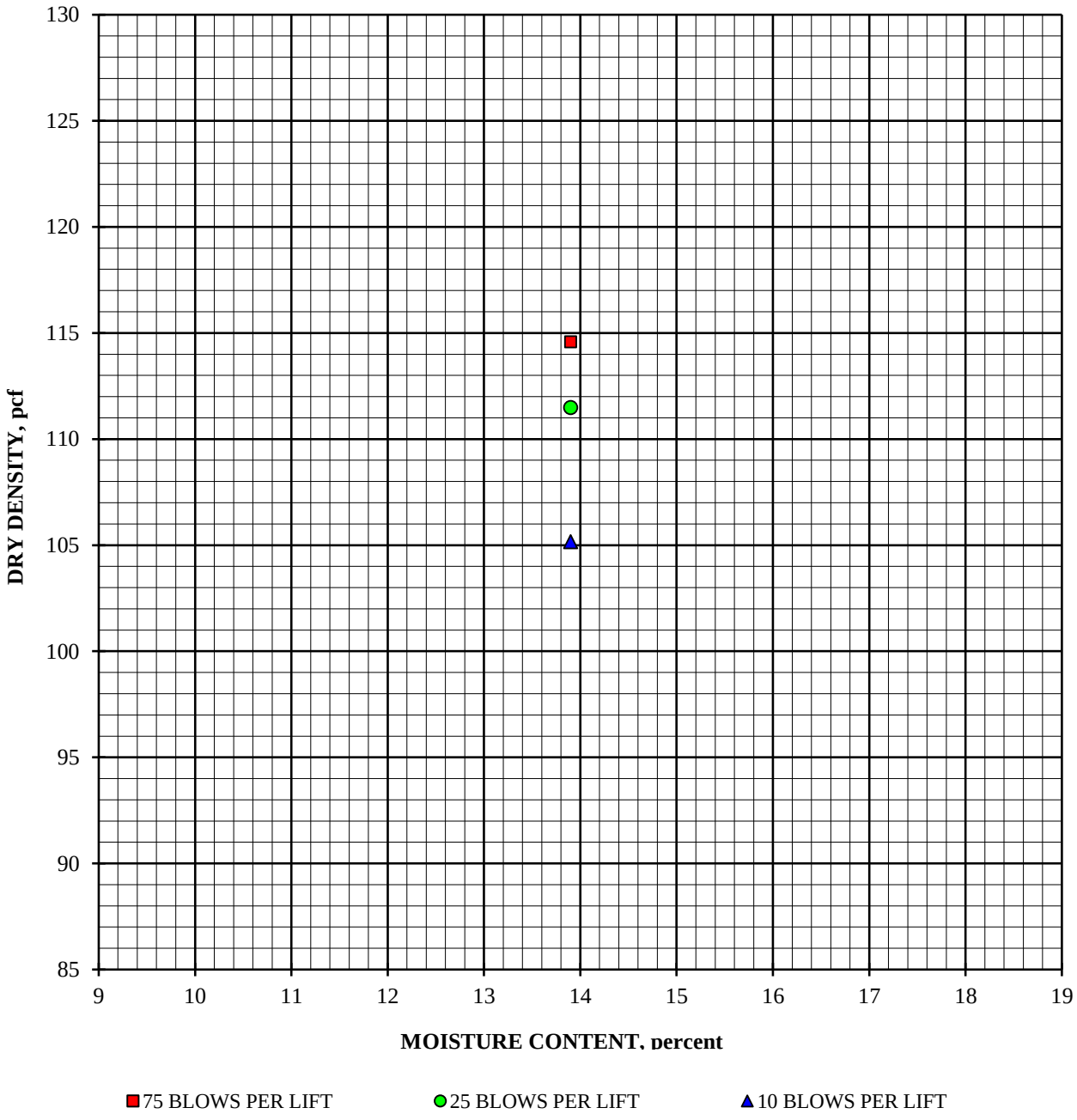
ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #62 @ 2.0 - 5.0'

February 11, 2020

Dark Brown Sandy Lean Clay (CL) With 5% Lime by Dry Weight

DRY DENSITY vs. MOISTURE CONTENT



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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #62 @ 2.0 - 5.0'

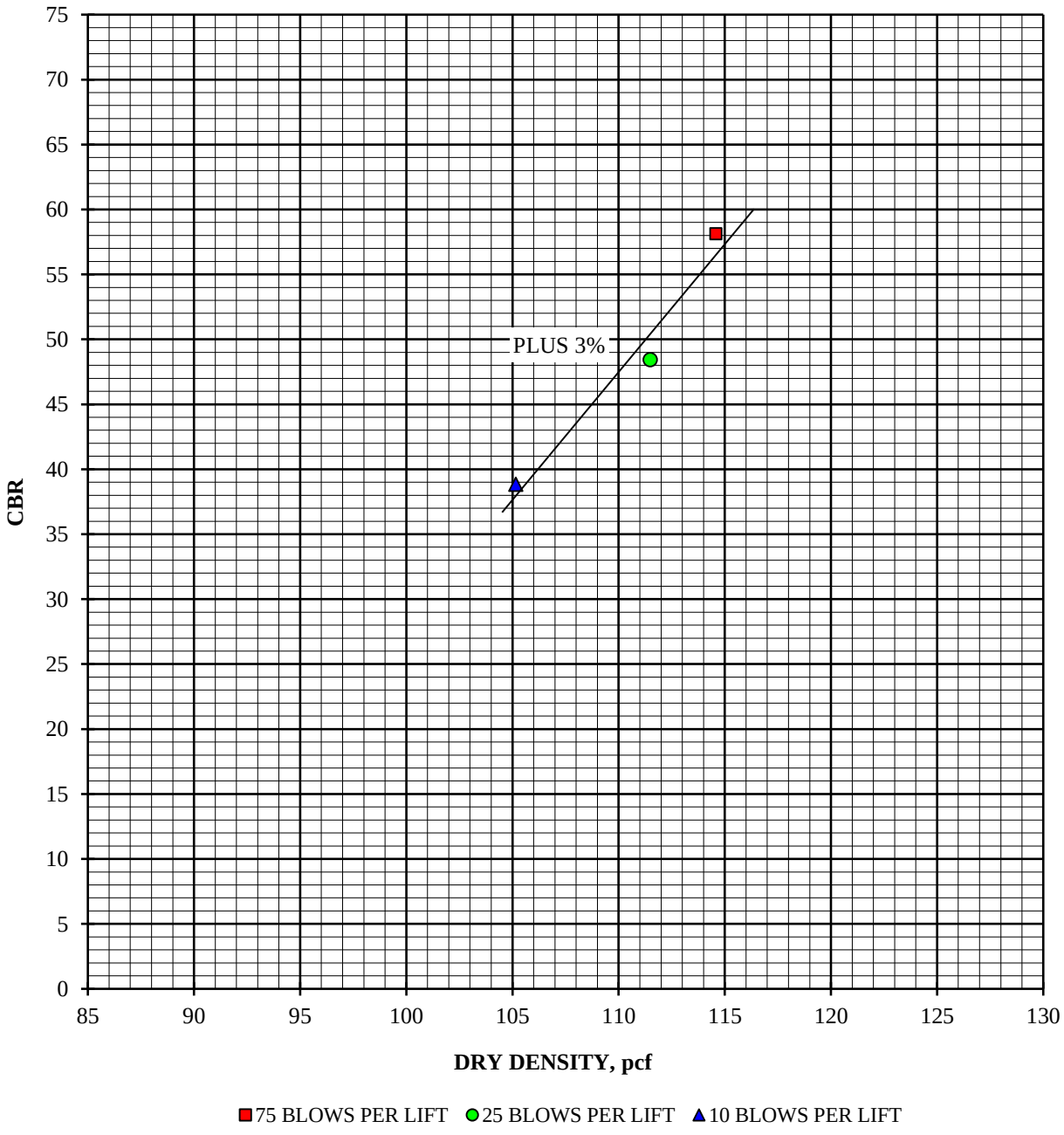
February 11, 2020

Dark Brown Sandy Lean Clay (CL)

With 5% Lime by Dry Weight

DRY DENSITY vs. CBR

Arranged According to Moisture Content



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Oxnard, California

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #66 @ 4.0 - 5.0'
Dark Brown Silty, Clayey Sand (SC-SM)

February 11, 2020

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	99.2	101.9	109.0
Moisture content, %, before soak	10.5	13.5	16.5
Moisture content, %, after soak, avg.	26.1	25.6	20.1
Moisture content, %, after soak, top 1"	26.5	25.4	21.1
Expansion, %, 96 hour soak	6.8	1.5	0.2
Bearing Ratio, 0.100" penetration	2.4	3.3	3.7

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	108.6	111.8	113.6
Moisture content, %, before soak	10.5	13.5	16.5
Moisture content, %, after soak, avg.	21.9	19.4	-188.3
Moisture content, %, after soak, top 1"	22.9	19.0	19.1
Expansion, %, 96 hour soak	8.0	3.9	0.9
Bearing Ratio, 0.100" penetration	5.4	17.5	12.1

75 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	115.0	120.1	115.1
Moisture content, %, before soak	10.5	13.5	16.5
Moisture content, %, after soak, avg.	18.2	16.7	18.8
Moisture content, %, after soak, top 1"	18.7	18.1	17.4
Expansion, %, 96 hour soak	5.3	3.2	0.2
Bearing Ratio, 0.100" penetration	16.5	22.8	8.5

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CALIFORNIA BEARING RATIO

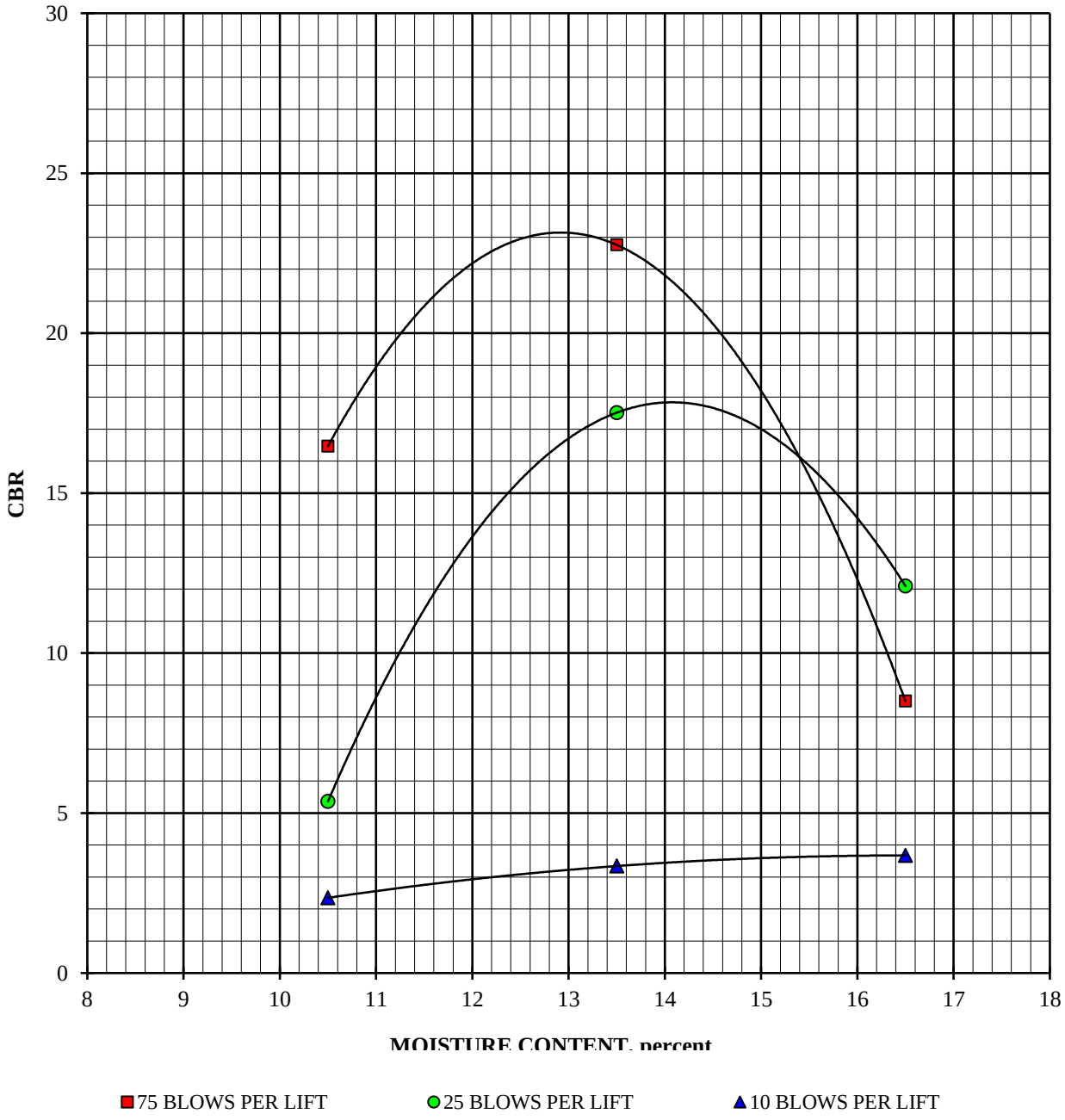
ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #66 @ 4.0 - 5.0'

February 11, 2020

Dark Brown Silty, Clayey Sand (SC-SM)

CBR vs. MOISTURE CONTENT



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CALIFORNIA BEARING RATIO

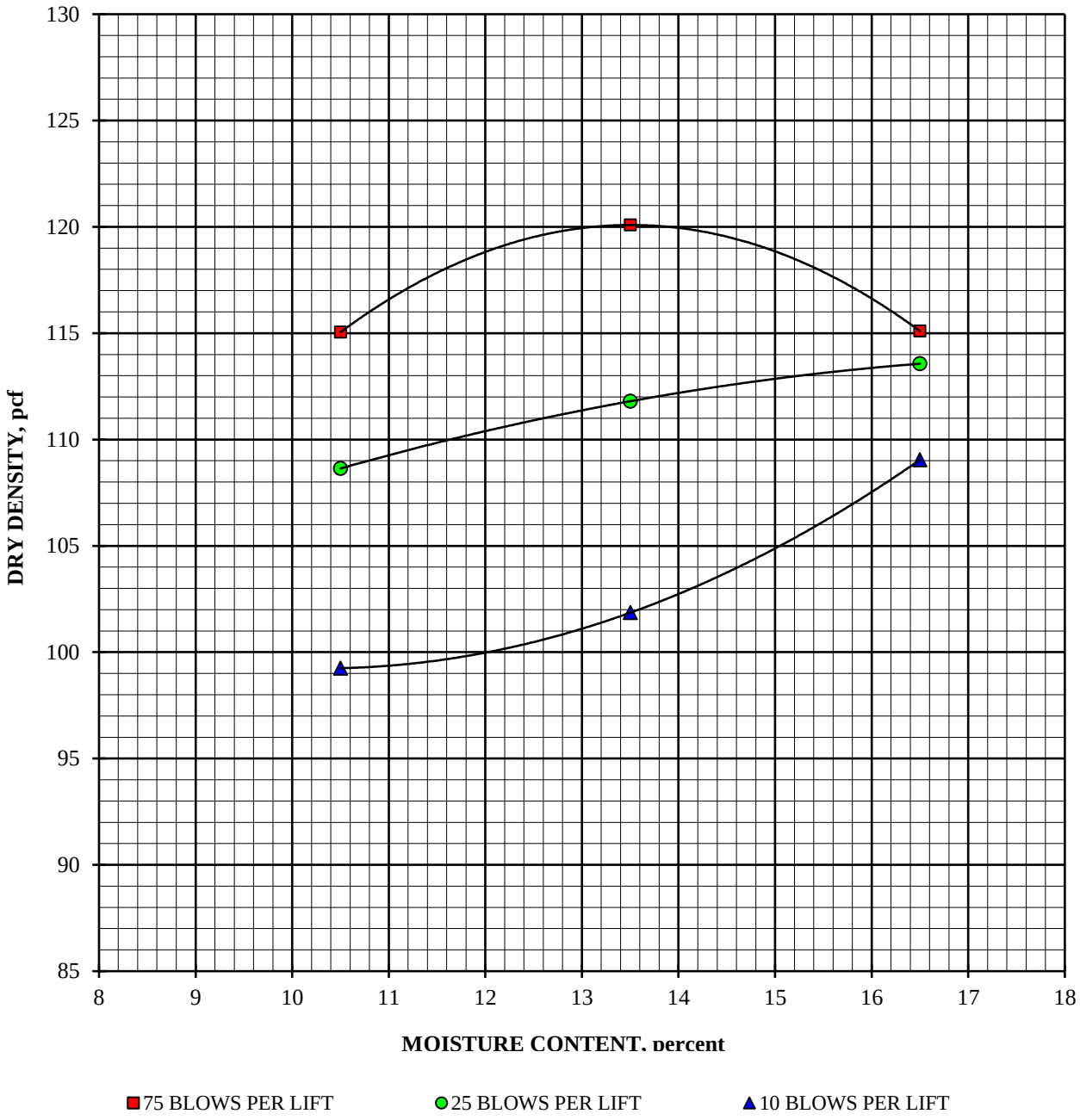
ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #66 @ 4.0 - 5.0'

February 11, 2020

Dark Brown Silty, Clayey Sand (SC-SM)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport Taxiway F Improvements
Oxnard, California

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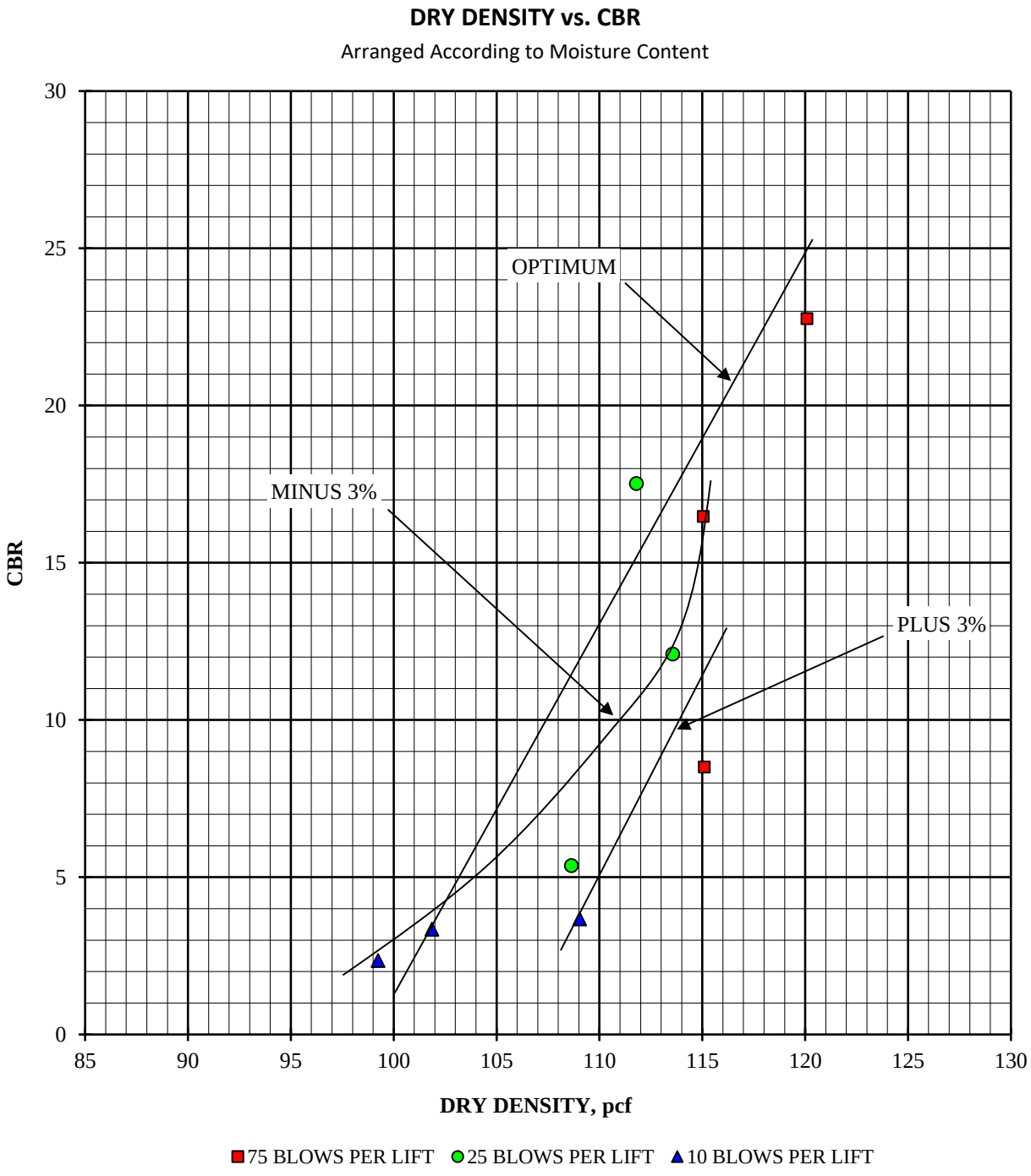
CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #66 @ 4.0 - 5.0'

February 11, 2020

Dark Brown Silty, Clayey Sand (SC-SM)



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Oxnard, California

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CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #70 @ 1.5 - 4.5'
Dark Brown Sandy Lean Clay (CL)

February 11, 2020

10 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	107.1	111.0	115.4
Moisture content, %, before soak	7.2	10.2	13.2
Moisture content, %, after soak, avg.	18.9	11.7	14.7
Moisture content, %, after soak, top 1"	22.7	19.8	17.6
Expansion, %, 96 hour soak	1.4	2.4	0.1
Bearing Ratio, 0.100" penetration	4.2	10.1	4.2

25 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	116.8	119.8	117.7
Moisture content, %, before soak	7.2	10.2	13.2
Moisture content, %, after soak, avg.	10.7	11.6	13.9
Moisture content, %, after soak, top 1"	18.6	17.7	16.4
Expansion, %, 96 hour soak	1.1	1.6	0.1
Bearing Ratio, 0.100" penetration	16.2	33.4	9.6

75 BLOWS PER LIFT

	-3 Percent	Optimum Moisture	+ 3 percent
Dry density, pcf, before soak	121.8	125.2	117.3
Moisture content, %, before soak	7.2	10.2	13.2
Moisture content, %, after soak, avg.	13.2	12.7	15.1
Moisture content, %, after soak, top 1"	16.9	14.9	14.5
Expansion, %, 96 hour soak	1.6	0.4	0.2
Bearing Ratio, 0.100" penetration	19.4	44.9	6.2

Oxnard Airport Taxiway F Improvements
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CALIFORNIA BEARING RATIO

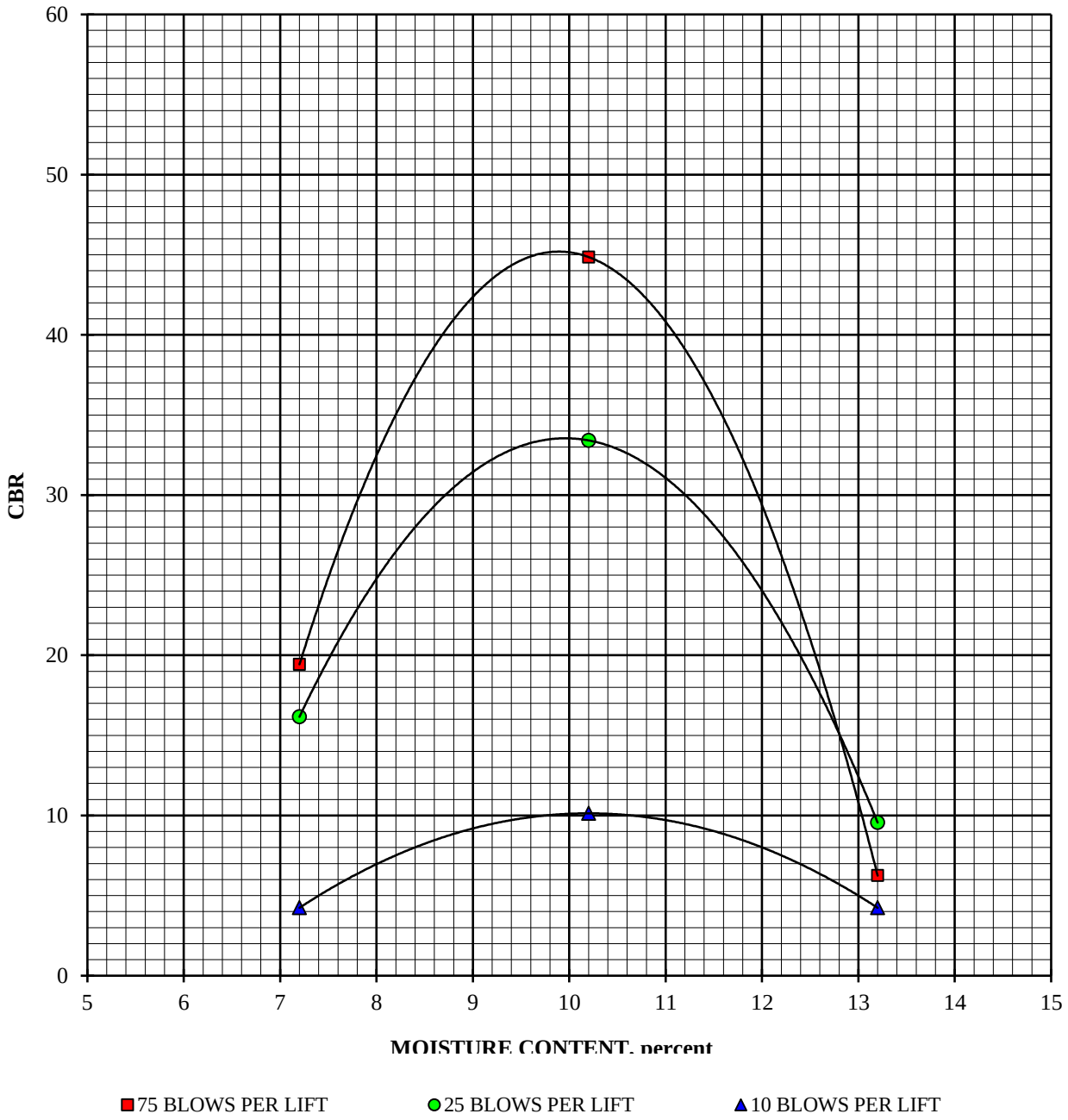
ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #70 @ 1.5 - 4.5'

February 11, 2020

Dark Brown Sandy Lean Clay (CL)

CBR vs. MOISTURE CONTENT



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CALIFORNIA BEARING RATIO

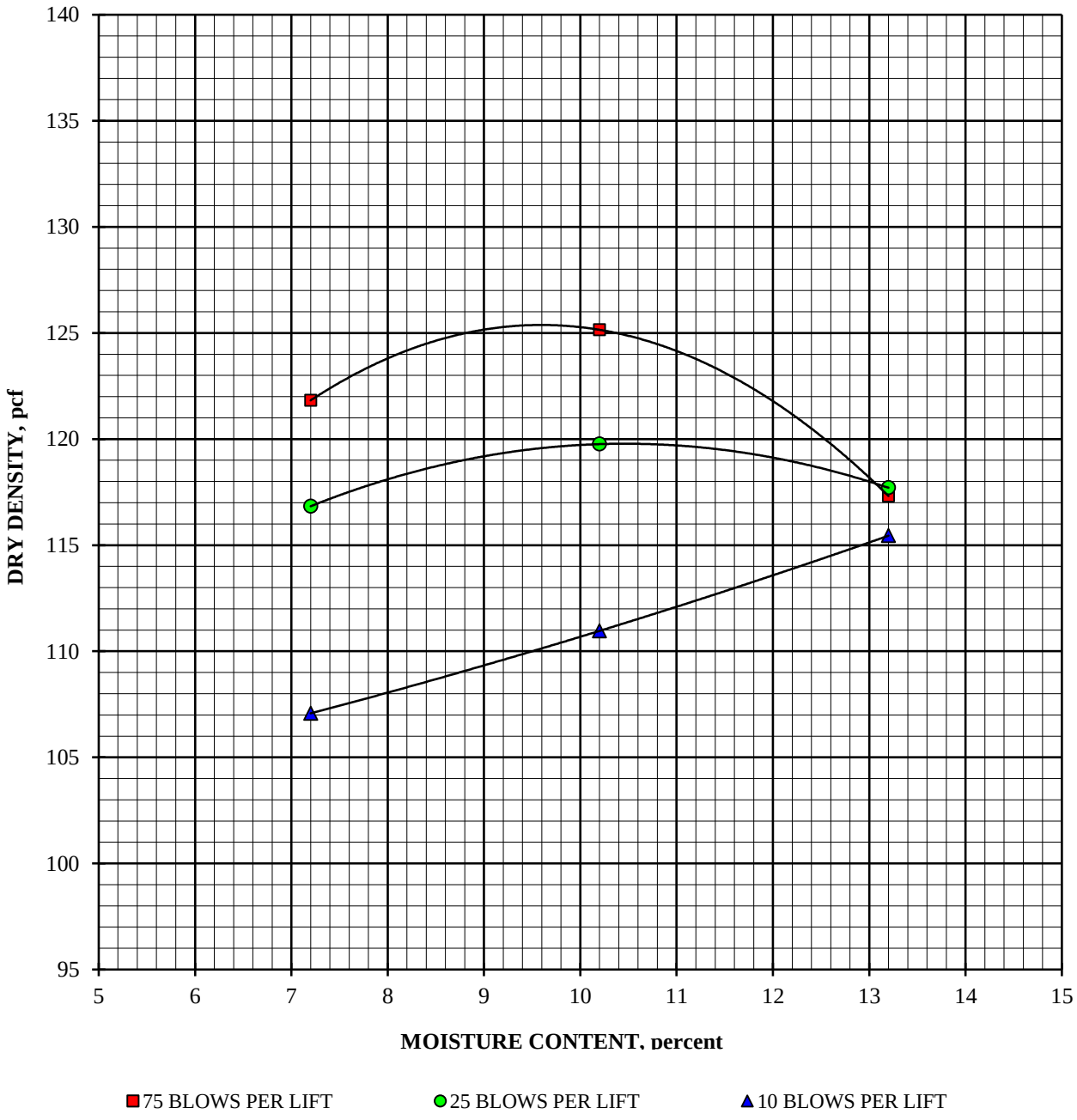
ASTM D 1883-16 (For a Range of Moisture Contents)

Boring #70 @ 1.5 - 4.5'

February 11, 2020

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. MOISTURE CONTENT



Oxnard Airport Taxiway F Improvements
Oxnard, California

302524-002

CALIFORNIA BEARING RATIO

ASTM D 1883-16 (For a Range of Moisture Contents)

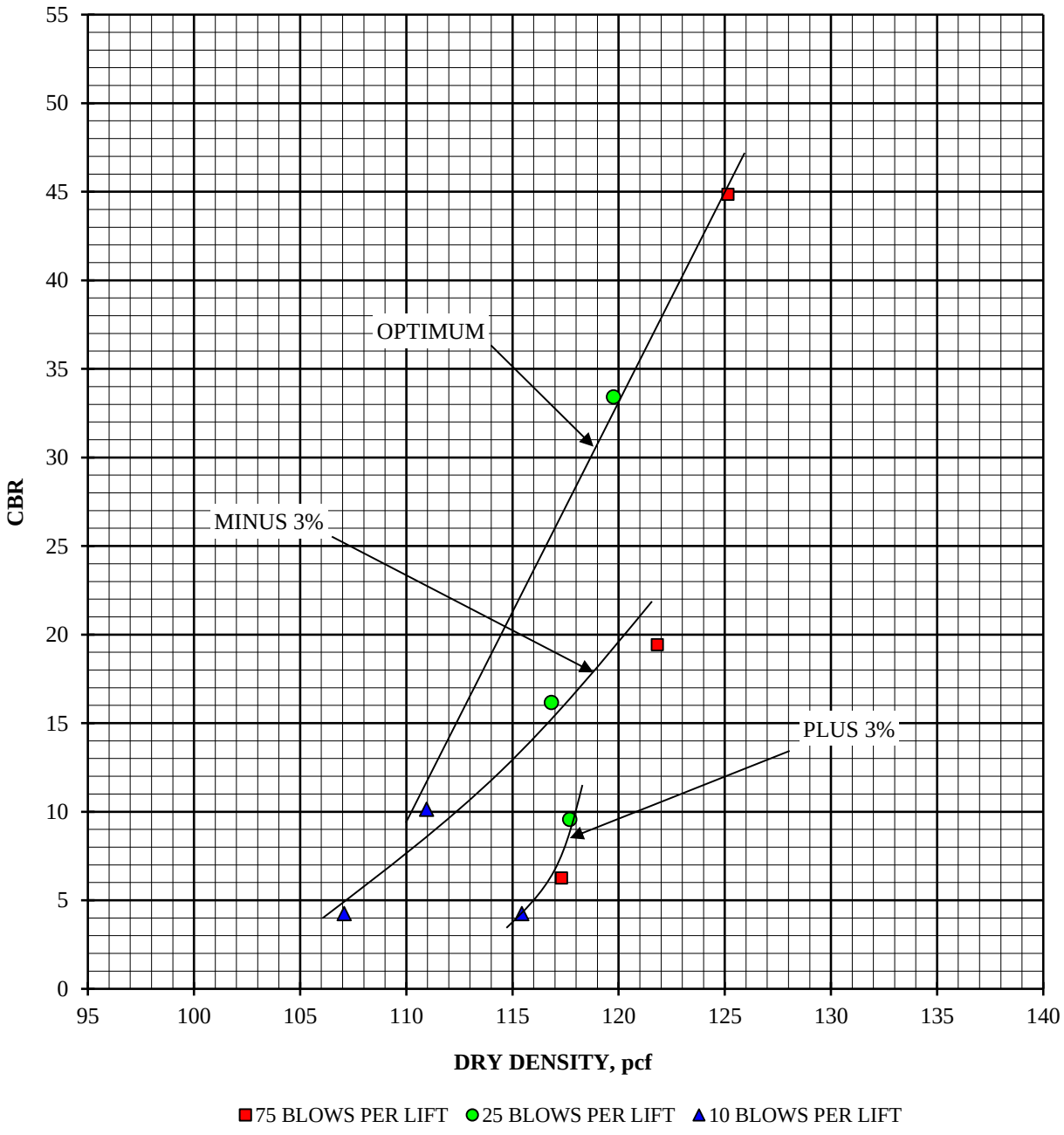
Boring #70 @ 1.5 - 4.5'

February 11, 2020

Dark Brown Sandy Lean Clay (CL)

DRY DENSITY vs. CBR

Arranged According to Moisture Content



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APPENDIX C

Figures 2A and 2B – Existing Pavement Section Thicknesses

Figures 3A and 3B – USCS Soil Types at Subgrade

Figures 4A and 4B – CBR Values – 95% Minimum Relative Compaction at Subgrade

Figures 5A and 5B – Approximate CBR Values Based on Existing Soil Density and Moisture Content at Subgrade

Figures 6A and 6B – Subgrade Soil Moisture Content

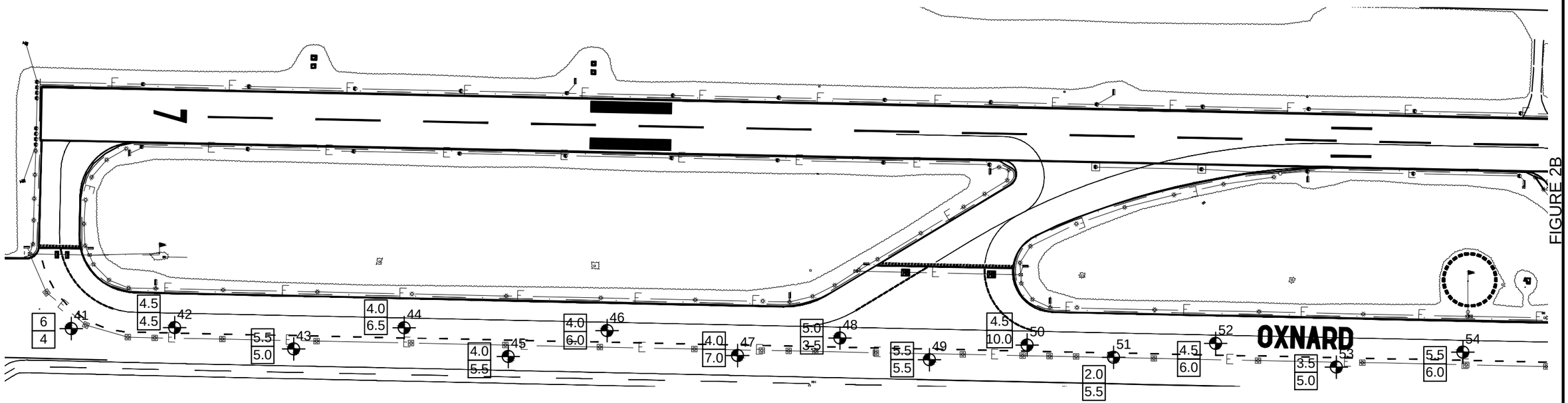

FIGURE 2B

LEGEND

41-70 Boring Location (Approx.)

4 Asphalt Concrete (AC) - Inches
9 Miscellaneous Aggregate Base (mAB) - Inches

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

N

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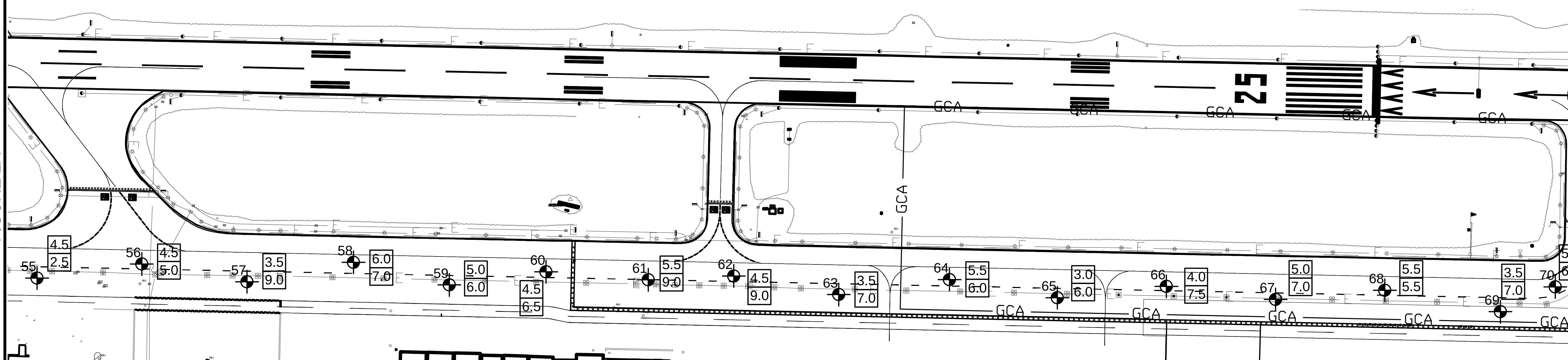
FIGURE 2A - EXISTING PAVEMENT SECTION THICKNESSES

Oxnard Airport - Taxiway F Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

Project No.
302524-002

FIGURE 2A



LEGEND

41-70 Boring Location (Approx.)

4 Asphalt Concrete (AC) - Inches

9 Miscellaneous Aggregate Base (mAB) - Inches

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

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FIGURE 2B - EXISTING PAVEMENT SECTION THICKNESSES

Oxnard Airport - Taxiway F Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

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302524-002

Sheet 2 of 2

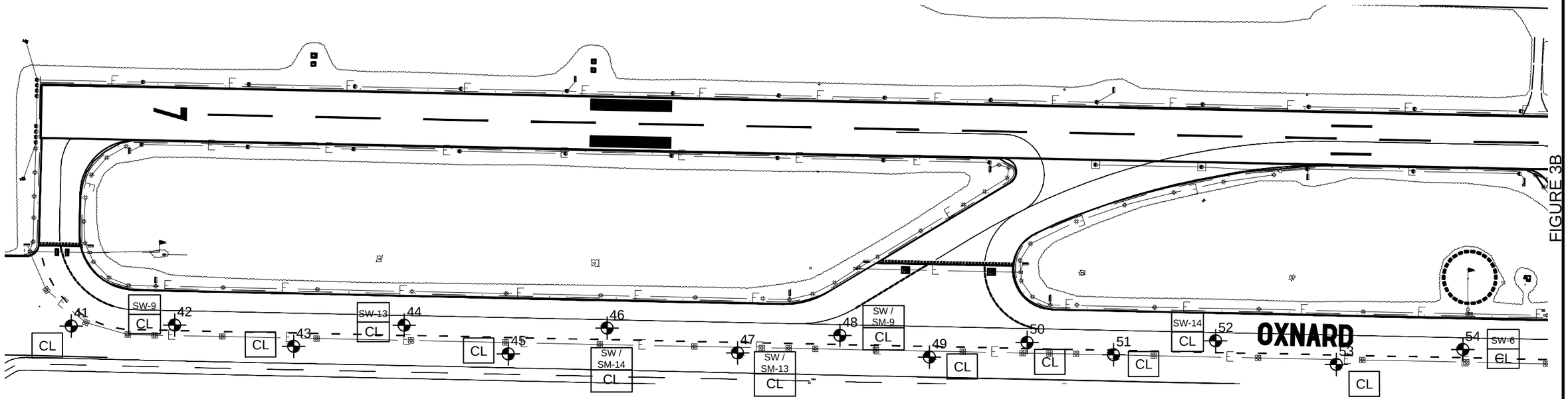

FIGURE 3B

LEGEND

41-70 — Boring Location (Approx.)

SW-X — WELL GRADED SAND (with or without silt and/or gravel) - "X" indicates thickness in inches where present below pavement section

CL — SANDY LEAN CLAY

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

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FIGURE 3A - USCS SOIL TYPES AT SUBGRADE

Oxnard Airport - Taxiway F Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

Project No.
302524-002

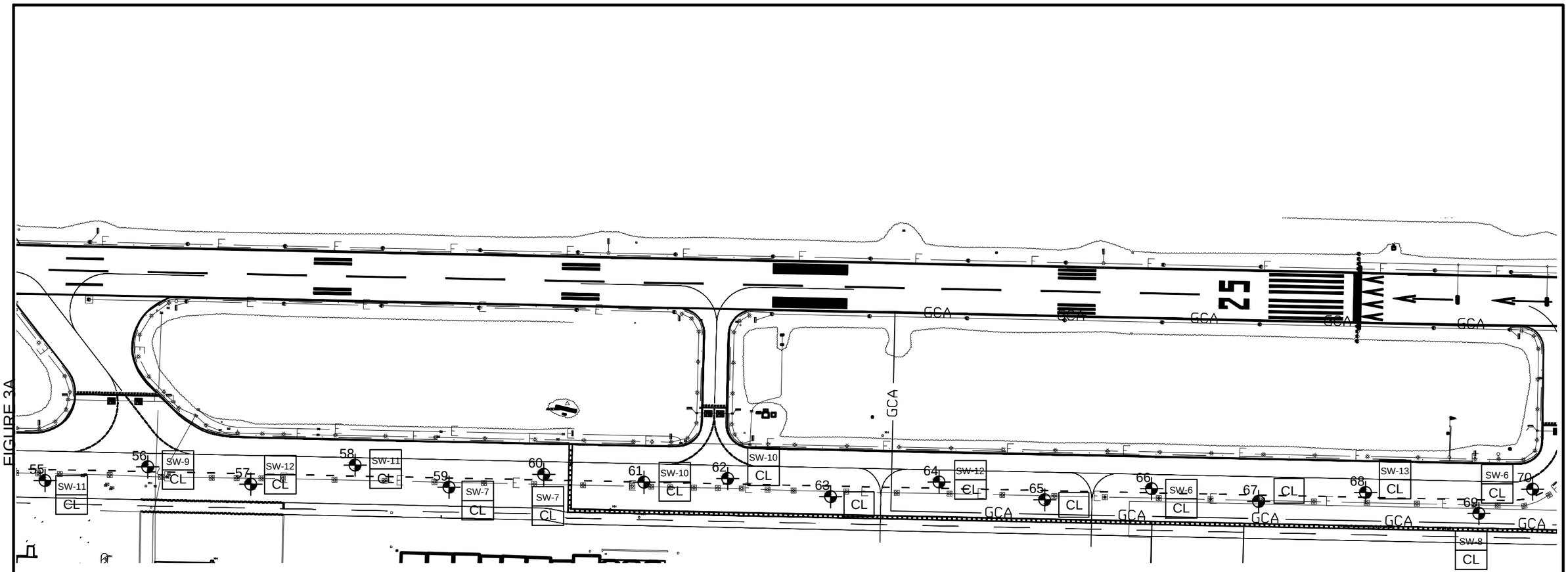

FIGURE 3A

OXNARD AIRPORT TAXIWAY F IMPROVEMENTS\021320\maps

LEGEND

41-70 — Boring Location (Approx.)

SP-X — WELL GRADED SAND (with or without silt and/or gravel) - "X" indicates thickness in inches where present below pavement section

CL — SANDY LEAN CLAY

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

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FIGURE 3B - USCS SOIL TYPES AT SUBGRADE

Oxnard Airport - Taxiway F Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

Project No.
302524-002

Sheet 2 of 2

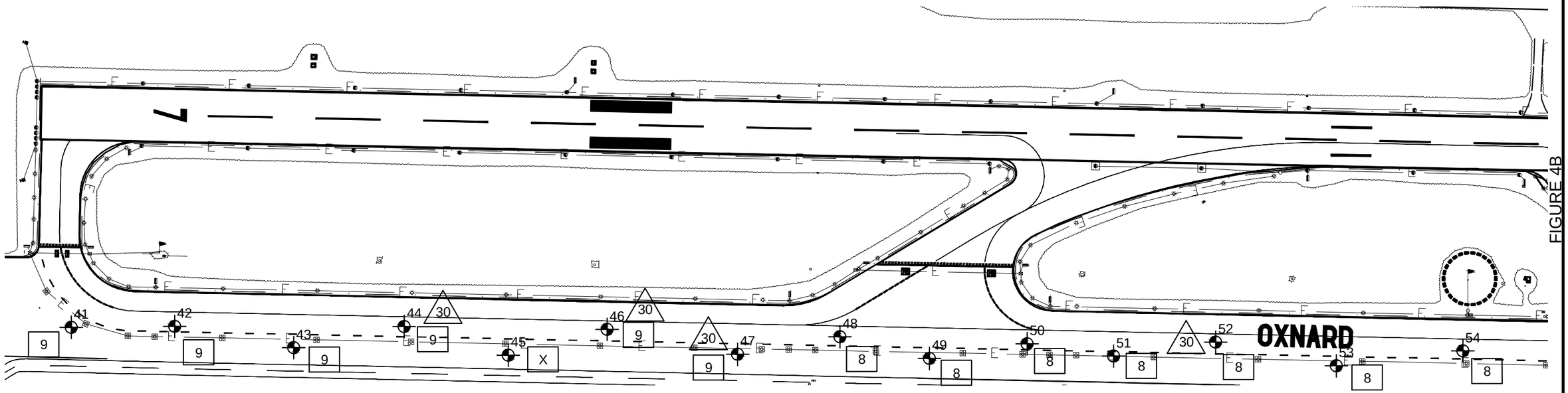

FIGURE 4B

LEGEND

41-70 Boring Location (Approx.)

X Subgrade soil from this boring lime treated at 5 percent by dry weight - See report text

9 Recommended soil CBR value for reconstructed areas with subgrade compacted to a minimum of 95 percent relative compaction and moisture content in range of optimum +/- 2 percent. Well graded sand layers, where present, disregarded

30 Recommended soil CBR value for well graded sand layer (Fill), directly below AC/mAB pavement section, where 10 inches or thicker, compacted to a minimum of 95 percent relative compaction, and moisture content in range of optimum +/- 2 percent.

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

N

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OXNARD_AIRPORT_TAXIWAY_F_IMPROVEMENTS021320maps

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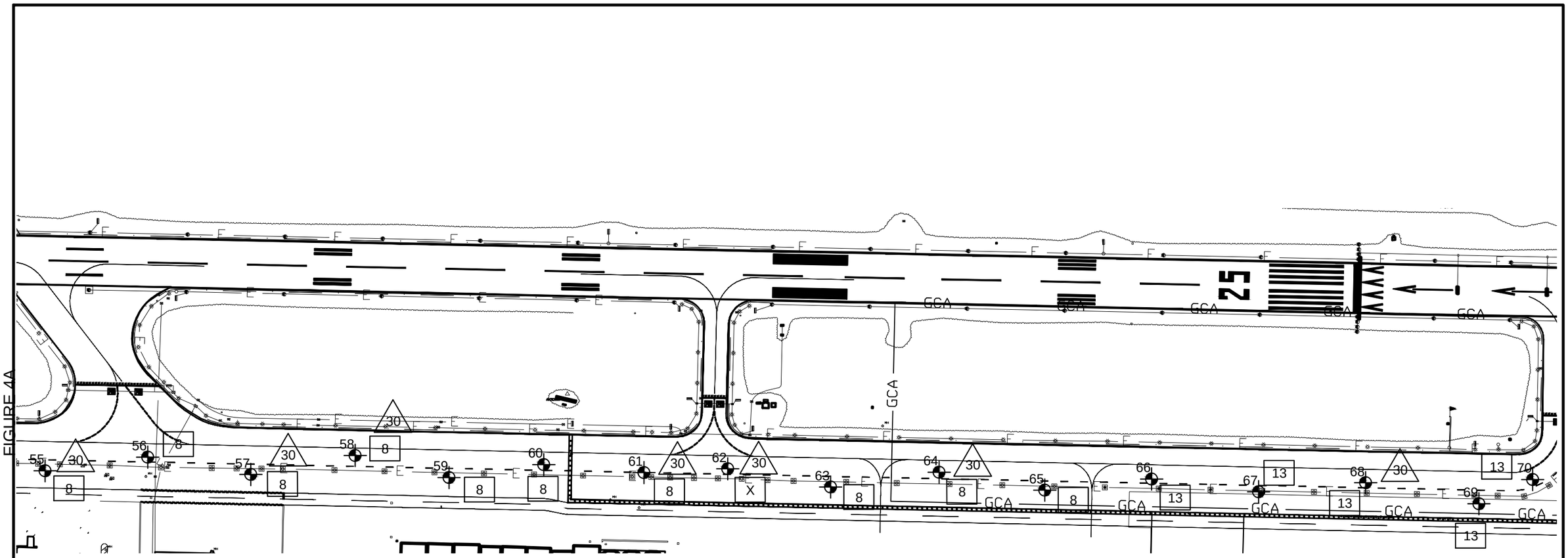
FIGURE 4A - CBR VALUES - 95% MINIMUM RELATIVE COMPACTION AT SUBGRADE

Oxnard Airport - Taxiway F Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

Project No.
302524-002



LEGEND

41-70 Boring Location (Approx.)

X — Subgrade soil from this boring lime treated at 5 percent by dry weight - See report text

9 — Recommended soil CBR value for reconstructed areas with subgrade compacted to a minimum of 95 percent relative compaction and moisture content in range of optimum +/- 2 percent. Well graded sand layers, where present, disregarded

30 — Recommended soil CBR value for well graded sand layer (Fill), directly below AC/mAB pavement section, where 10 inches or thicker, compacted to a minimum of 95 percent relative compaction, and moisture content in range of optimum +/- 2 percent.

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

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FIGURE 4B - CBR VALUES - 95% MINIMUM RELATIVE COMPACTION AT SUBGRADE

Oxnard Airport - Taxiway F Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

Project No.
302524-002

FIGURE 4A

OXNARD AIRPORT TAXIWAY F IMPROVEMENTS021320mxps

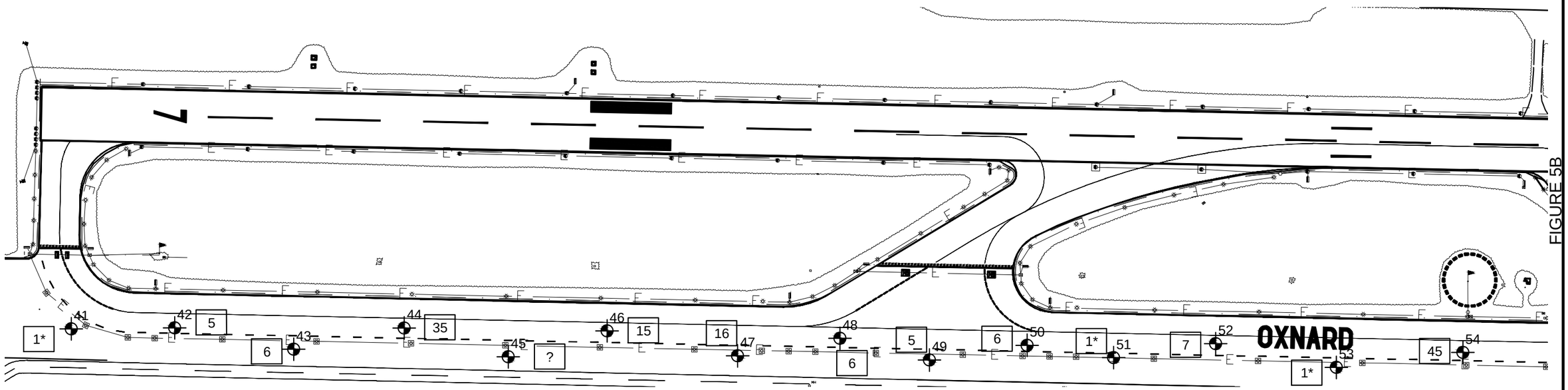

FIGURE 5B

LEGEND

41-70 Boring Location (Approx.)

8 Approximate CBR based on existing soil density and moisture content at subgrade. Thin well graded sand layers directly below misc. AB, where present, disregarded if less than 10 inches. If well graded sand layer is 10 inches or greater, value shown is for that layer.

1* Asterisk indicates soil density and/or moisture content beyond laboratory data range - CBR value estimated only. Question mark (?) indicates no estimate possible from laboratory data.

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

N

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OXNARD_AIRPORT_TAXIWAY_F_IMPROVEMENTS021320maps

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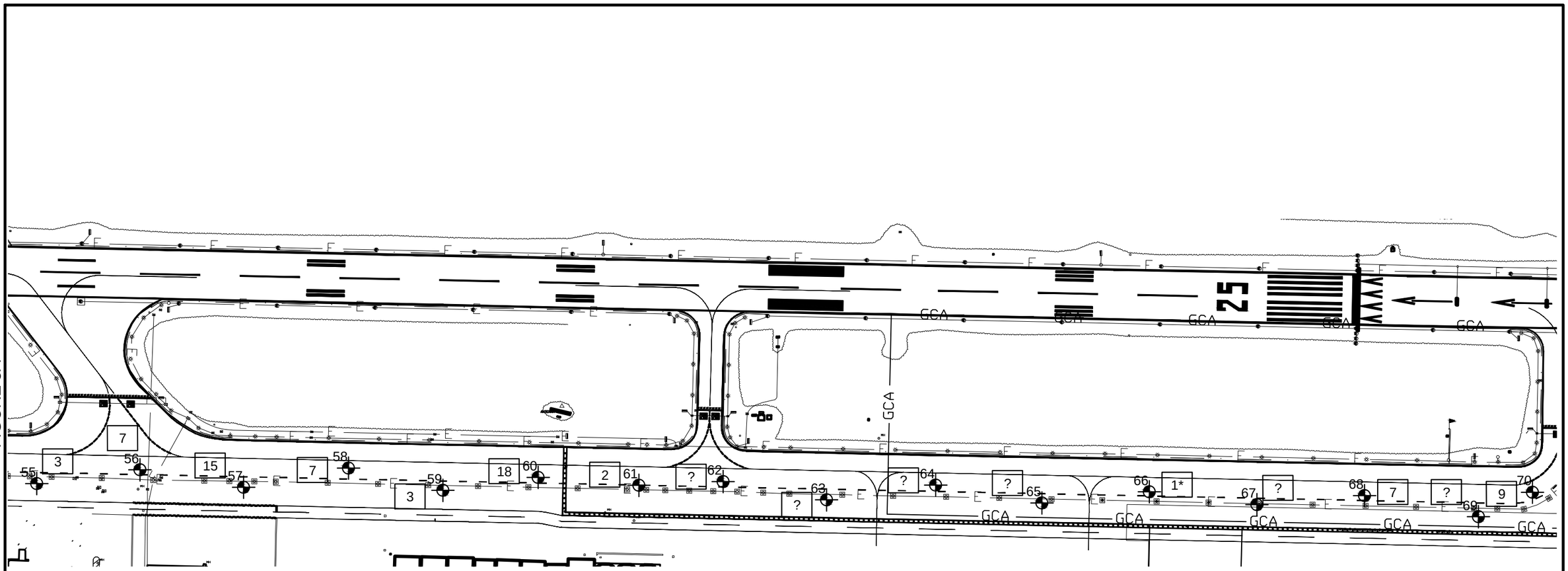
FIGURE 5A - APPROXIMATE CBR VALUES BASED ON EXISTING SOIL DENSITY AND MOISTURE CONTENT AT SUBGRADE

Oxnard Airport - Taxiway F Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

Project No.
302524-002

FIGURE 5A



LEGEND

41-70 ⊕ Boring Location (Approx.)

8 Approximate CBR based on existing soil density and moisture content at subgrade. Thin well graded sand layers directly below misc. AB, where present, disregarded if less than 10 inches. If well graded sand layer is 10 inches or greater, value shown is for that layer.

1* Asterisk indicates soil density and/or moisture content beyond laboratory data range - CBR value estimated only. Question mark (?) indicates no estimate possible from laboratory data.

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

N

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OXNARD AIRPORT TAXIWAY F IMPROVEMENTS\021320maps

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FIGURE 5B - APPROXIMATE CBR VALUES BASED ON EXISTING SOIL DENSITY AND MOISTURE CONTENT AT SUBGRADE

Oxnard Airport Runway and Taxiway
Rehabilitation/Reconstruction
Oxnard, California

Date
February 2020

Project No.
302524-002

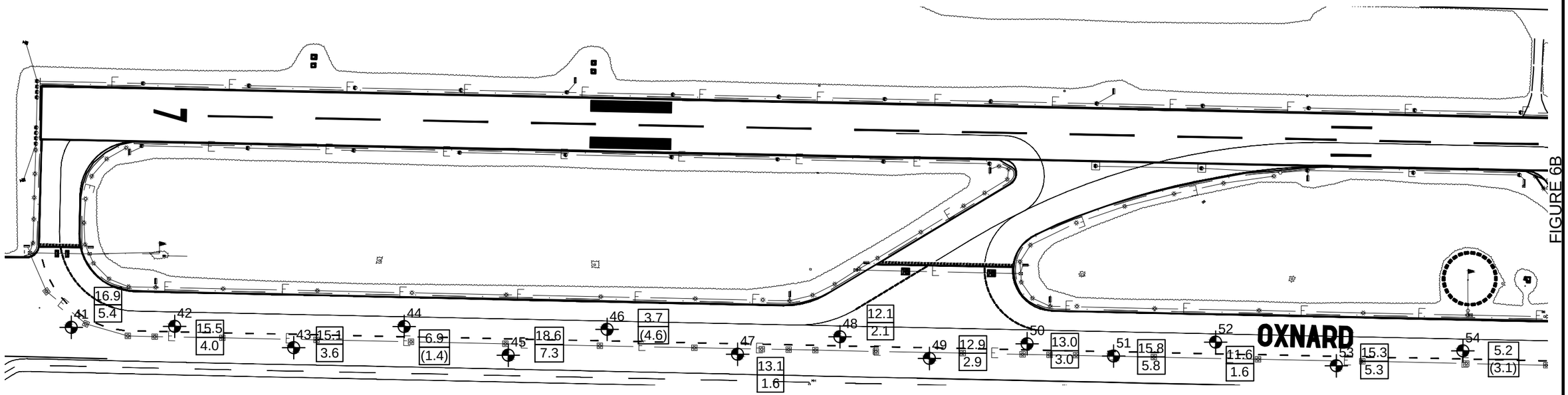

FIGURE 6B

LEGEND

41-70 Boring Location (Approx.)

4.7	Subgrade soil moisture content at time of drilling, percent
(6.0)	Percent above (below) optimum moisture content

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

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OXNARD AIRPORT TAXIWAY F IMPROVEMENTS021320maps

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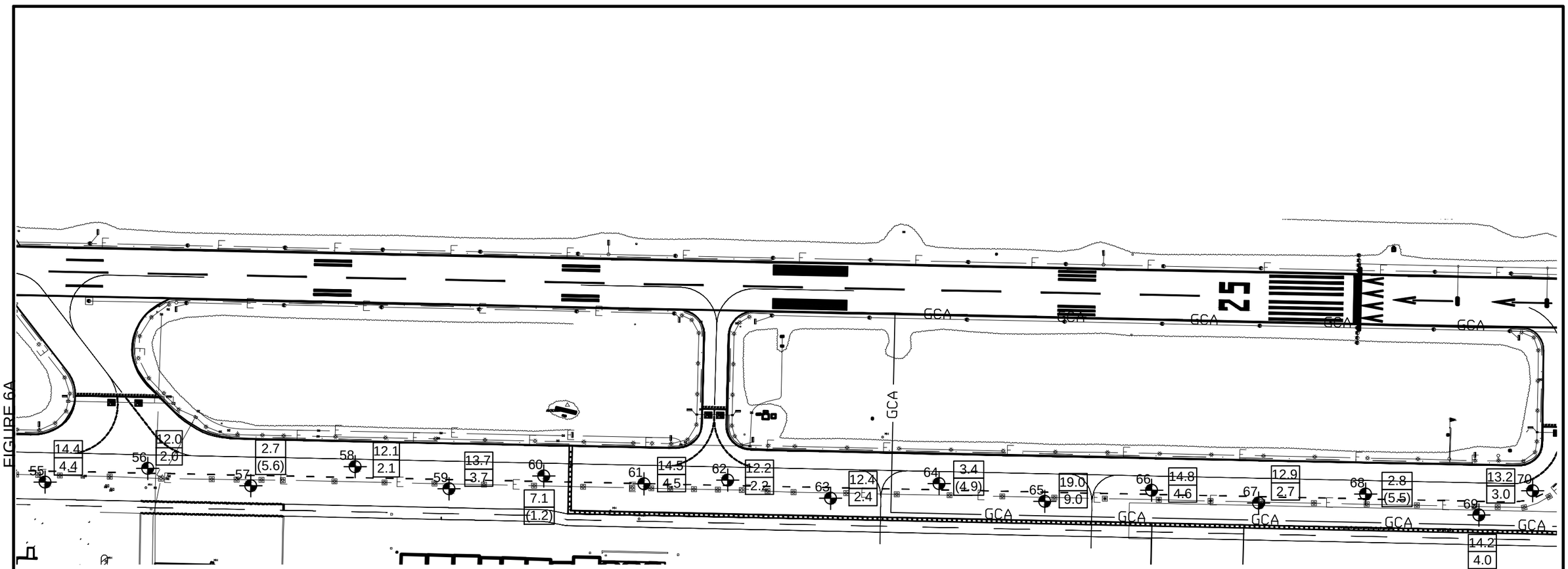
FIGURE 6A - SUBGRADE SOIL MOISTURE CONTENT

Oxnard Airport - Taxiway F Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

Project No.
302524-002



LEGEND

41-70 Boring Location (Approx.)

4.7 Subgrade soil moisture content at time of drilling, percent
(6.0) Percent above (below) optimum moisture content

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

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FIGURE 6B - SUBGRADE SOIL MOISTURE CONTENT

Oxnard Airport - Taxiway F Improvements
2889 West 5th Street
Oxnard, California

Date
February 2020

Project No.
302524-002

Sheet 2 of 2

OXNARD_AIRPORT_TAXIWAY_F_IMPROVEMENTS021320mxds FIGURE 6A

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APPENDIX D

Estimates of Earthwork Shrinkage

OXNARD AIRPORT **ESP File No. 302524-002**

TAXIWAY F IMPROVEMENTS

Estimates of Soil Shrinkage Using In-Place Density Values from Borings and Assumed Final Relative Compaction Values. All Calculations Based on Uniform Density, Moisture Content and Compaction Effort Negative Values Indicate Expansion (Bulking).

Boring No.	Depth	Material Description	USCS Classificatior	Maximum Density, pcf	Optimum Moisture, %
41	1.5 - 5.0 ft	Dark Brown Sandy Lean Clay	CL	122.7	11.5
45	1.0 - 5.0 ft	Dark Brown Sandy Lean Clay	CL	123.1	11.3
46	1.0 - 2.0 ft	Lt Brn Well Gra Sand w/ Silt and Grav	SW-SM	128.7	8.3
54	4.0 - 5.0 ft	Dark Brown Sandy Lean Clay	CL	117.5	13.8
55	1.5 - 5.0 ft	Dark Brown Sandy Lean Clay	CL	125.4	10.0
62	2.0 - 5.0 ft.	Dark Brown Sandy Lean Clay	CL	124.7	10.9
66	4.0 - 5.0 ft	Dark Brown Silty, Clayey Sand	SC-SM	119.8	13.5
70	1.5 - 4.5	Dark Brown Sandy Lean Clay	CL	124.1	10.2

Boring	Depth, Ft. Below Ext. Grade	Moisture in Place, %	Dry Density in Place, pcf	Maximum Dens., pcf	Existing Rel.Comp. %	Shrinkage, % at 95.0 % Rel. Comp.	Shrinkage, % at 96.0 % Rel. Comp.	Shrinkage, % at 97.0 % Rel. Comp.	Shrinkage, % at 98.0 % Rel. Comp.	Shrinkage, % at 99.0 % Rel. Comp.	Shrinkage, % at 100.0 % Rel. Comp.
41	1.0 - 1.5	16.9	107.9	122.7	87.9	8.0	9.2	10.3	11.4	12.6	13.7
42	1.5 - 2.0	15.5	112.3	122.7	91.5	3.8	4.9	6.0	7.1	8.2	9.3
43	1.0 - 1.5	15.1	115.9	122.7	94.5	0.6	1.6	2.7	3.7	4.8	5.9
44	1.5 - 2.0	6.9	120.7	128.7	93.8	1.3	2.4	3.4	4.5	5.6	6.6
45	1.0 - 1.5	18.6	106.3	123.1	86.4	10.0	11.2	12.3	13.5	14.6	15.8
46	1.0 - 1.5	3.7	117.1	128.7	91.0	4.4	5.5	6.6	7.7	8.8	9.9
47	1.0 - 1.5	13.1	116.4	122.7	94.9	0.1	1.2	2.3	3.3	4.4	5.4
48	1.0 - 1.5	12.1	114.8	125.4	91.5	3.8	4.9	6.0	7.0	8.1	9.2
49	1.0 - 1.5	12.9	114.7	125.4	91.5	3.9	5.0	6.0	7.1	8.2	9.3
50	1.0 - 1.5	13.0	119.0	125.4	94.9	0.1	1.2	2.2	3.3	4.3	5.4
51	1.0 - 1.5	15.8	111.4	125.4	88.8	6.9	8.1	9.2	10.3	11.4	12.6
52	1.5 - 2.0	11.6	114.6	125.4	91.4	4.0	5.0	6.1	7.2	8.3	9.4
53	1.0 - 1.5	15.3	110.1	125.4	87.8	8.2	9.3	10.5	11.6	12.8	13.9
54	1.5 - 2.0	5.2	124.3	128.7	96.6	-1.6	-0.6	0.4	1.5	2.5	3.5
55	1.0 - 1.5	14.4	108.9	125.4	86.8	9.4	10.5	11.7	12.8	14.0	15.2
56	1.5 - 2.0	12.0	116.0	125.4	92.5	2.7	3.8	4.9	5.9	7.0	8.1
57	1.0 - 1.5	2.7	117.6	128.7	91.4	4.0	5.1	6.2	7.3	8.3	9.4
58	1.5 -2.0	12.1	115.5	125.4	92.1	3.1	4.2	5.3	6.4	7.5	8.6
59	1.5 -2.0	13.7	110.8	125.4	88.4	7.5	8.6	9.8	10.9	12.0	13.2
60	1.0 - 1.5	7.1	119.8	128.7	93.1	2.1	3.1	4.2	5.3	6.4	7.4
61	1.5 - 2.0	14.5	112.4	125.4	89.6	6.0	7.1	8.2	9.3	10.5	11.6
62	1.5 - 2.0	12.2	90.7	124.7	72.7	30.6	32.0	33.4	34.7	36.1	37.5
63	1.0 - 1.5	12.4	77.9	125.4	62.1	52.9	54.5	56.1	57.8	59.4	61.0
64	1.0 - 1.5	3.4	104.3	128.7	81.0	17.2	18.5	19.7	20.9	22.2	23.4
65	1.0 - 1.5	19.0	102.3	125.4	81.6	16.5	17.7	18.9	20.1	21.4	22.6
66	1.0 - 1.5	14.8	115.4	124.1	93.0	2.2	3.2	4.3	5.4	6.5	7.5
67	1.0 - 1.5	12.9	106.7	124.1	86.0	10.5	11.7	12.8	14.0	15.1	16.3
68	1.0 - 1.5	2.8	112.7	128.7	87.6	8.5	9.6	10.8	11.9	13.1	14.2
69	1.0 - 1.5	14.2	126.1	124.1	101.6	-6.5	-5.5	-4.5	-3.6	-2.6	-1.6
70	1.0 - 1.5	13.2	118.0	124.1	95.1	-0.1	1.0	2.0	3.1	4.1	5.2
					Average Shrinkage, percent, all locations :	**7.3**	**8.5**	**9.6**	**10.7**	**11.9**	**13.0**
						At 95.0 % Rel. Comp.	**At 96.0 % Rel. Comp.**	**At 97.0 % Rel. Comp.**	**At 98.0 % Rel. Comp.**	**At 99.0 % Rel. Comp.**	**At 100.0 % Rel. Comp.**

Earth Systems
4378 Old Santa Fe Road | San Luis Obispo, CA 93401 | Ph: 805.544.3276 | www.earthsystems.com

July 10, 2020

FILE NO.: 302524-001
and 302524-002

Mr. Jeffrey Leonard, PE
Vice President
Mead & Hunt, Inc.
1360 19th Hole Drive, Suite 200
Windsor, CA 95492

PROJECT: OXNARD AIRPORT
2889 WEST 5TH STREET
OXNARD, CALIFORNIA

RUNWAY 7-25 AND TAXIWAY CONNECTOR IMPROVEMENTS
TAXIWAY F IMPROVEMENTS

SUBJECT: Addendum to Geotechnical Engineering Reports – Sulfate Testing of Subgrade Soils for Evaluation of Lime Treatment Option

TECHNICAL REFS: Attached

Dear Mr. Leonard:

As authorized, we have completed sulfate testing on samples of anticipated subgrade soils secured during the field investigations for our geotechnical engineering reports (ESP 2020a and 2020b) for these two projects. The purpose of testing was to satisfy the cautionary note in the introduction to Item P-155 Lime Treated Subgrade (FAA 2018) which states: "…The Engineer must check the soluble sulfate contents of the soils during design to determine if stabilization with lime can react and induce heave…"

As noted in *Recommended Practice for Stabilization of Sulfate-Rich Subgrade Soils* (NAP 2009), "…Even though stabilization improves engineering properties, problems can arise when calcium-based stabilizers (i.e., lime) are used in soils rich in sulfate-bearing minerals. Stabilization of sulfate-rich soils in the presence of excess moisture may lead to the formation of minerals such as ettringite and/or thaumasite and can cause distress in or even destruction of pavement structures due to heaving. However, the extent of such distress varies among soils and is dependent on factors including the strength of the soil matrix and the spatial distribution and arrangement of ettringite (and/or thaumasite) crystals in the matrix…Ettringite precipitation is a complex problem related not only to soil composition but also to construction methods, availability of water, ion migration, and void structures in pavements." This publication also

provides a table indicating the level of risk associated with the use of calcium-based (lime) stabilizers in sulfate rich soils. A partial reproduction of the table (sulfate concentrations listed in parts per million (ppm) rather than percent by dry weight) is as follows:

Risk Involved	Soluble Sulfate Concentrations - ppm
Low Risk	Below 3,000 ppm
Moderate Risk	Between 3,000 and 5,000 ppm
Moderate to High Risk	Between 5,000 and 8,000 ppm
High to Unacceptable Risk	Greater than 8,000 ppm
Unacceptable Risk	Greater than 10,000 ppm

On October 16, 2019, four samples from the Taxiway F Improvements project area were sent to HDR, Inc., of Claremont, California for soluble sulfate testing. The Chain of Custody & Request for Laboratory Testing documentation for these samples, as well as the test results, are included in Appendix A.

After the results from this initial round of sulfate testing were received and reviewed, it was noted that one of the samples showed a significant level (23,500 ppm) of soluble sulfates. Per the table above, the material would therefore have an unacceptable level of risk associated with calcium-based lime treatment. The other three samples had soluble sulfate levels of 3,930 ppm, 1,100 ppm and 169 ppm. This nonuniformity and significant disparity among the results led to consideration for additional testing.

To further characterize the subgrade soils, a second set of six total samples were authorized to be sent to HDR, Inc., for soluble sulfate testing. Four samples were selected from material maintained in our laboratory from the Runway 7-25 and Taxiway Connector Improvements project area, and two additional samples were from the Taxiway F Improvements area. The intent of the additional samples was to provide data for the entire extent of both project areas, and to determine, if possible, if the sulfate-rich conditions were only present in an isolated area. The Chain of Custody & Request for Laboratory Testing documentation for this second round of samples, as well as the test results, are included in Appendix B. This second round of testing yielded a similar disparity in the results, with values ranging from a low of 740 ppm to a high of 20,200 ppm.

The results from both rounds of soluble sulfate testing are plotted on a map of the combined projects in Appendix C. The map also indicates the locations of the exploratory borings performed for the two reports by this firm (ESP 2020a and 2020b).

Based on information contained in *Recommended Practice for Stabilization of Sulfate-Rich Subgrade Soils* (NAP 2009), a limited program of swell testing was completed to determine, if possible, the effect of extended mellowing time and remixing on a samples of lime treated soil prior to compaction. For this test, the soil sample with the greatest soluble sulfate content (Boring 41 from 1.5 to 5.0 feet below existing grade) was treated with 5 percent lime by dry weight (BDW), in single and full stages, with the following modified mellowing time periods:

- 1 stage - 5 percent lime treatment BDW, 1 day mellowing period
- 2 stage – 2.5 percent lime treatment BDW, 2 days mellowing period; 2.5 percent additional lime treatment, 1 day additional mellowing period
- 2 stage – 2.5 percent lime treatment BDW, 4 days mellowing period; 2.5 percent additional lime treatment, 1 day additional mellowing period
- 2 stage – 2.5 percent lime treatment BDW, 6 days mellowing period; 2.5 percent additional lime treatment, 1 day additional mellowing period

During the mellowing period, the treated soil was maintained in sealed plastic bags with moisture contents of 3 to 4 percent above optimum moisture. After completion of the various mellowing periods, the samples were recompacted at 95 percent of maximum dry density as standard one-dimensional consolidation samples (ASTM D 2435/D 2435M-11). The samples were then loaded with a surcharge of 100 psf (to simulate an overlying AC/AB pavement section approximately 8 to 9 inches thick), and fully inundated. All samples collapsed under the surcharge loading prior to swelling. Initial collapse values ranged from 0.0010 to 0.0015-inch. As of January 27, 2020, all four samples appeared to have reached a steady state condition, with no swell or collapse (measured to the nearest 0.0001-inch) for at least 2 days prior to final readings.

The results of the swell tests are provided in the summary graph in Appendix C. The graph is not a complete depiction of all swell readings taken over time for all samples, but rather a plot of the maximum swell values observed as of January 27, 2020, vs. the time for mellowing and additional

mixing prior to recompaction. The graph does indicate that, as noted in *Recommended Practice for Stabilization of Sulfate-Rich Subgrade Soils* (NAP 2009), the potential for swell is reduced with additional mellowing and mixing time.

As a final check on the effect of lime treatment, a sample of the 2-stage lime treated soil (5 percent total BDW) from Boring 41 at 1 to 5 feet that had mellowed for 13 days was sent to HDR, Inc., for soluble sulfate testing. The intent of this testing was to determine the residual sulfate level in the soil after lime treatment. The Chain of Custody & Request for Laboratory Testing documentation for this final round of testing, as well as the test results, are included in Appendix D. The result of this test was a residual soluble sulfate level of 677 ppm, a considerable reduction from the initially tested value (before lime treatment) of 23,500 ppm.

Based on this testing program, and on information obtained from *Recommended Practice for Stabilization of Sulfate-Rich Subgrade Soils* (NAP 2009), we recommend the following be incorporated in the plans for this project if it is elected to utilize lime treatment for improvement of subgrade soil strength and a subsequent reduction in the design pavement section. Information regarding subgrade soil strengths in the untreated and treated condition, and all other soil parameters, are contained in our project soil engineering reports (ESP 2020a and 2020b).

1. The minimum percentage of lime treatment should be 5 percent by dry weight of material (BDW).

2. The *Recommended Practice for Stabilization of Sulfate-Rich Subgrade Soils* (NAP 2009) indicates that in Texas, a single full application of lime should be utilized, rather than a split application. Discussions with a lime treatment contractor in this area indicates split applications appear to be more successful for higher lime treatment percentages. For this project, we recommend that the lime treatment should be performed in two stages, slightly weighted more to the initial treatment (i.e., 3 percent initial and 2 percent secondary).

3. A minimum mellowing period of 7 days should be used for the initial stage, prior to the secondary lime treatment operation. During this initial mellowing period the lime-treated soil moisture content should be maintained at 4 to 5 percent above optimum as a

minimum. The lime treated soil moisture content should be checked frequently, and additional moisture added as necessary to maintain the chemical reaction. During the initial mellowing period, the lime treated soil should be remixed a minimum of 3 times after the initial mixing period. Adequate water during the mellowing process is critical, and all efforts should be made to keep the soil moisture contents as high as possible without sacrificing construction workability and quality.

4. After the initial mellowing and mixing period is complete, the second stage lime treatment process can be completed. The secondary mellowing period should be a minimum of 48 hours; the lime treated soil should be maintained at 4 to 5 percent above optimum as a minimum, and the soil should be remixed at least 1 additional time following the final lime treatment/mixing operation, prior to final compaction.

5. To assure plenty of soil moisture during the treatment/mixing/mellowing operation, the contractor should consider lime application via slurry rather than in dry form.

6. Consideration should be given to testing the source of construction water available for the contractor during the lime treatment process, to verify that sulfates will not be added to the lime treated soil during the moisture conditioning process.

7. During final compaction operations, the lime treated soil should be maintained at as high a moisture content as possible (i.e., 3 to 5 percent above optimum moisture content, or more), while still achieving the required relative compaction, and maintaining firm and stable conditions during proofrolling.

8. To reduce the potential for the introduction of moisture into the compacted and completed overall pavement section, which can contribute to degradation of the lime treated soil layer, proper drainage of the pavement section, shoulders and adjacent infield areas is essential. Pavement edge drains should also be considered, to create a dewatered drainage flow line that is at least 3 feet below subgrade elevation.

9. Quality control testing (swell and/or residual sulfates) of the finished lime treated soil should be completed prior to compaction, to assure that the application, mixing and mellowing processes have been successful.

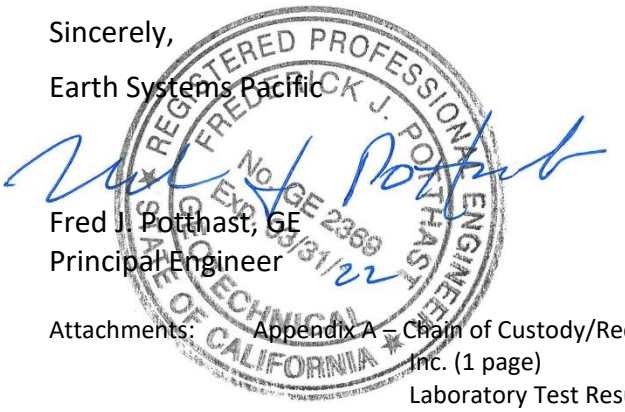
End of Addendum 1.

Please attach a copy of this addendum to each copy of the referenced report that you may have.

If there are any questions regarding this addendum, please feel free to contact the undersigned.

Sincerely,

Earth Systems Pacific



Fred J. Potthast, GE
Principal Engineer

Attachments: Appendix A – Chain of Custody/Request for Laboratory Testing, Samples Sent 10/16/19 to HDR, Inc. (1 page)
Laboratory Test Results for Samples Sent 10/16/19 to HDR, Inc. (2 pages)

Appendix B – Chain of Custody/Request for Laboratory Testing, Samples Sent 11/26/19 to HDR, Inc. (1 page)
Laboratory Test Results for Samples Sent 11/26/19 to HDR, Inc. (2 pages)

Appendix C – Soluble Sulfates Test Results Map (2 sheets)
Summary graph of Swell Test Data (1 page)

Appendix D – Chain of Custody/Request for Laboratory Testing, Samples Sent 1/16/20 to HDR, Inc. (1 page)
Laboratory Test Results for Samples Sent 1/16/20 to HDR, Inc. (2 pages)

Doc No.: 2002-053.ADD1/cr

TECHNICAL REFERENCE LIST

ESP (Earth Systems Pacific). January 21, 2020a. Geotechnical Engineering Report, Oxnard Airport, Runway and Taxiway Connector Rehabilitation/Reconstruction, Oxnard, California. Doc. No. 1901-103.SER.REV. File No. 302324-001

ESP (Earth Systems Pacific). July 10, 2020b. Geotechnical Engineering Report, Oxnard Airport, Taxiway F Improvements, Oxnard, California. Doc. No. 2007-040.SER. File No. 302324-002

FAA (U.S. Department of Transportation, Federal Aviation Administration). December 21, 2018. Standard Specifications for Construction of Airports. Advisory Circular 150/5370-10H.

NAP (The National Academies Press). 2009. Recommended Practice for Stabilization of Sulfate-Rich Subgrade Soils.

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APPENDIX A

Chain of Custody/Lab Test Request for Samples Sent to HDR, Inc. on 10/16/19

Laboratory Test Results for Samples Sent to HDR, Inc. on 10/16/19

www.hdrinc.com

CHAIN OF CUSTODY & REQUEST FOR LABORATORY TESTING

DATE SENT: 10/1619

TESTING REQUESTED BY:

Name Fred J. Potthast, GE — Phone: 805-544-3276 x-3

Company Name Earth Systems Pacific — Fax: 805-544-1786

Address 4378 Old Santa Fe Road — Email: fred@earthsystems.com

City San Luis Obispo State CA Zip 93401

SEND RESULTS TO: Same as above

Name Fred J. Potthast, GE

Address Earth Systems Pacific

City San Luis Obispo State CA Zip 93401

Email: fred@earthsystems.com

SEND INVOICE TO: ☑ Same as above

Name

Address

City State Zip

Email:

PROJECT INFORMATION:

P.O. NO: 302524-002 *JOB NAME:* Oxnard Airport - Taxiway F Improvements *JOB NO:* 302524-002

Site Address 2889 West 5th Street

Site City OxnardBoring Site State CA

TESTS DESIRED:

General Building Materials Corrosivity Testing (resistivity+pH, soluble salts analysis e.g. chlorides, sulfates, ammonium, nitrate)

CalTrans Corrosivity Testing (resistivity+pH per CTM 643, soluble salts analysis with chloride & sulfate per CTM 422 & 417)

Other (Please be specific) Soluable sulfates only

RESULTS DESIRED:

☐ SOIL CORROSIVITY REPORT (with test results)*

☑ TEST RESULTS ONLY (no report)

☐ Expedite turn-around **(additional cost per sample)**. Expedited date required? _____

- **ARE THESE SAMPLES FROM A QUARANTINE AREA?** YES☐ NO☑

Boring ID	Depth	Type of Soil	Boring ID	Depth	Type of Soil
Boring 41	1.5 - 5	Dark Brown Clayey Sand (SC)			
Boring 55	1.5 - 5	Dark Brown Clayey Sand (SC)			
Boring 70	1.5 - 4.5	Brown Clayey Sand (SC)			
Boring 46	1 - 2	LTBr. Poorly grded Sand (SP)			

CHAIN OF CUSTODY

Signature	Print Name	Company	Date	Time
Collected/Relinquished By	Sean Hemmer	Earth Systems Pacific	10/11/19	PM
Received By:	Terry Reyes	Earth Systems Pacific	10/11/19	PM
Relinquished By:	Terry Reyes	Earth Systems Pacific	10/16/19	pm
Received By:				
Relinquished By:				
Received By Laboratory:				

*IF SOIL CORROSIVITY REPORT IS REQUESTED PLEASE FILL OUT PAGE 2

TRANSMITTAL LETTER

DATE: November 19, 2019

ATTENTION: **Fred J. Potthast**

TO: Earth Systems Pacific
4378 Old Santa Fe Road
San Luis Obispo, CA 93401

SUBJECT: Laboratory Test Data
Oxnard Airport - Taxiway F Improvements
Your #302524-002, HDR Lab #19-0799LAB

COMMENTS: Enclosed are the results for the subject project.

James T. Keegan, MD
Corrosion and Lab Services Section Manager

431 West Baseline Road · Claremont, CA 91711
Phone: 909.962.5485 · Fax: 909.626.3316

Table 1 - Laboratory Tests on Soil Samples

Earth Systems Pacific
Oxnard Airport - Taxiway F Improvements
Your #302524-002, HDR Lab #19-0799LAB
19-Nov-19

Sample ID			Boring 41 @ 1.5-5'	Boring 55 @ 1.5-5'	Boring 70 @ 1.5-4.5'	Boring 46 @ 1-2'
Resistivity		**Units**				
as-received		ohm-cm	na	na	na	na
saturated		ohm-cm	na	na	na	na
pH			na	na	na	na
Electrical Conductivity		mS/cm	3.78	1.40	0.18	0.48
Chemical Analyses						
Cations						
calcium	Ca^{2+}	mg/kg	na	na	na	na
magnesium	Mg^{2+}	mg/kg	na	na	na	na
sodium	Na^{1+}	mg/kg	na	na	na	na
potassium	K^{1+}	mg/kg	na	na	na	na
Anions						
carbonate	CO_3^{2-}	mg/kg	na	na	na	na
bicarbonate	HCO_3^{1-}	mg/kg	na	na	na	na
fluoride	F^{1-}	mg/kg	na	na	na	na
chloride	Cl^{1-}	mg/kg	na	na	na	na
sulfate	SO_4^{2-}	mg/kg	23,500	3,930	169	1,100
phosphate	PO_4^{3-}	mg/kg	na	na	na	na
Other Tests						
ammonium	NH_4^{1+}	mg/kg	na	na	na	na
nitrate	NO_3^{1-}	mg/kg	na	na	na	na
sulfide	S^{2-}	qual	na	na	na	na
Redox		mV	na	na	na	na

Resistivity per ASTM G187, Cations per ASTM D6919, Anions per ASTM D4327, and Alkalinity per APHA 2320-B.
Electrical conductivity in millisiemens/cm and chemical analyses were made on a 1:5 soil-to-water extract.
mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

APPENDIX B

Chain of Custody/Lab Test Request for Samples Sent to HDR, Inc. on 11/26/19

Laboratory Test Results for Samples Sent to HDR, Inc. on 11/26/19

www.hdrinc.com

CHAIN OF CUSTODY & REQUEST FOR LABORATORY TESTING

DATE SENT: 11/26/19

TESTING REQUESTED BY:

Name: Fred J. Potthast, GE — Phone: 805-544-3276 x-3

Company Name: Earth Systems Pacific — Fax: 805-544-1786

Address: 4378 Old Santa Fe Road — Email: fred@earthsystems.com

City: San Luis Obispo — State: CA — Zip: 93401

SEND RESULTS TO: Same as above

Name: Fred J. Potthast, GE

Address: Earth Systems Pacific

City: San Luis Obispo — State: CA — Zip: 93401

Email: fred@earthsystems.com

SEND INVOICE TO: ☑ Same as above

Name:

Address:

City: — State: — Zip:

Email:

PROJECT INFORMATION:

P.O. NO: 302524-002 *JOB NAME:* Oxnard Airport - Runway and Taxiway Improvements *JOB NO:* 302524-002

Site Address: 2889 West 5th Street

Site City: Oxnard — Site State: CA

TESTS DESIRED:

General Building Materials Corrosivity Testing (resistivity+pH, soluble salts analysis e.g. chlorides, sulfates, ammonium, nitrate)

CalTrans Corrosivity Testing (resistivity+pH per CTM 643, soluble salts analysis with chloride & sulfate per CTM 422 & 417)

Other (Please be specific): Soluable sulfates only

RESULTS DESIRED:

☐ SOIL CORROSIVITY REPORT (with test results)*

☑ TEST RESULTS ONLY (no report)

☐ Expedite turn-around **(additional cost per sample)**. Expedited date required? _____

- **ARE THESE SAMPLES FROM A QUARANTINE AREA?** YES ☐ NO ☑

Boring ID	Depth	Type of Soil	Boring ID	Depth	Type of Soil
1	2 - 5	Dark Brown Sandy Lean Clay (CL)			
5	2 - 4	Dark Brown Silty Sand (SM)			
13	2 - 4	Dark Brown Sandy Lean Clay (CL)			
27	2 - 4	Dark Brown Sandy Lean Clay (CL)			
45	1 - 5	Dark Brown Clayey Sand (SC)			
62	2 - 5	Dark Brown Clayey Sand (SC)			

CHAIN OF CUSTODY

Signature	Print Name	Company	Date	Time
Collected/Relinquished By	R. Wagner/S. Hemmer	Earth Systems Pacific	Nov. '18 / Oct '19	PM
Received By:	Terry Reyes	Earth Systems Pacific	Nov. '18 / Oct '19	PM
Relinquished By:	Terry Reyes	Earth Systems Pacific	11/26/19	PM
Received By:				
Relinquished By:				
Received By Laboratory:				

*IF SOIL CORROSIVITY REPORT IS REQUESTED PLEASE FILL OUT PAGE 2

TRANSMITTAL LETTER

DATE: December 10, 2019

ATTENTION: **Fred J. Potthast**

TO: Earth Systems Pacific
4378 Old Santa Fe Road
San Luis Obispo, CA 93401

SUBJECT: Laboratory Test Data
Oxnard Airport - Runway & Taxiway
Your #302524-002, HDR Lab #19-0860LAB

COMMENTS: Enclosed are the results for the subject project.

James T. Keegan, MD
Corrosion and Lab Services Section Manager

431 West Baseline Road · Claremont, CA 91711
Phone: 909.962.5485 · Fax: 909.626.3316

Table 1 - Laboratory Tests on Soil Samples

Earth Systems Pacific
Oxnard Airport - Runway & Taxiway Improvements
Your #302524-002, HDR Lab #19-0860LAB
10-Dec-19

Sample ID			B1 @ 2-5'	B5 @ 2-4'	B13 @ 2-4'	B27 @ 2-4'	B45 @ 1-5'
Resistivity		**Units**					
as-received		ohm-cm	na	na	na	na	na
saturated		ohm-cm	na	na	na	na	na
pH			na	na	na	na	na
Electrical Conductivity		mS/cm	0.56	0.32	3.09	4.71	0.73
Chemical Analyses							
Cations							
calcium	Ca^{2+}	mg/kg	na	na	na	na	na
magnesium	Mg^{2+}	mg/kg	na	na	na	na	na
sodium	Na^{1+}	mg/kg	na	na	na	na	na
potassium	K^{1+}	mg/kg	na	na	na	na	na
Anions							
carbonate	CO_3^{2-}	mg/kg	na	na	na	na	na
bicarbonate	HCO_3^{1-}	mg/kg	na	na	na	na	na
fluoride	F^{1-}	mg/kg	na	na	na	na	na
chloride	Cl^{1-}	mg/kg	na	na	na	na	na
sulfate	SO_4^{2-}	mg/kg	1,200	740	11,400	20,200	1,960
phosphate	PO_4^{3-}	mg/kg	na	na	na	na	na
Other Tests							
ammonium	NH_4^{1+}	mg/kg	na	na	na	na	na
nitrate	NO_3^{1-}	mg/kg	na	na	na	na	na
sulfide	S^{2-}	qual	na	na	na	na	na
Redox		mV	na	na	na	na	na

Sulfate per ASTM D4327.
Electrical conductivity in millisiemens/cm and chemical analyses were made on a 1:5 soil-to-water extract.
mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

HDR

Table 1 - Laboratory Tests on Soil Samples

Earth Systems Pacific
Oxnard Airport - Runway & Taxiway Improvements
Your #302524-002, HDR Lab #19-0860LAB
10-Dec-19

Sample ID			B62 @ 2-5'
Resistivity		**Units**	
as-received		ohm-cm	na
saturated		ohm-cm	na
pH			na
Electrical Conductivity		mS/cm	0.59
Chemical Analyses			
Cations			
calcium	Ca^{2+}	mg/kg	na
magnesium	Mg^{2+}	mg/kg	na
sodium	Na^{1+}	mg/kg	na
potassium	K^{1+}	mg/kg	na
Anions			
carbonate	CO_3^{2-}	mg/kg	na
bicarbonate	HCO_3^{1-}	mg/kg	na
fluoride	F^{1-}	mg/kg	na
chloride	Cl^{1-}	mg/kg	na
sulfate	SO_4^{2-}	mg/kg	1,510
phosphate	PO_4^{3-}	mg/kg	na
Other Tests			
ammonium	NH_4^{1+}	mg/kg	na
nitrate	NO_3^{1-}	mg/kg	na
sulfide	S^{2-}	qual	na
Redox		mV	na

Sulfate per ASTM D4327.
Electrical conductivity in millisiemens/cm and chemical analyses were made on a 1:5 soil-to-water extract.
mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

431 West Baseline Road · Claremont, CA 91711
Phone: 909.962.5485 · Fax: 909.626.3316

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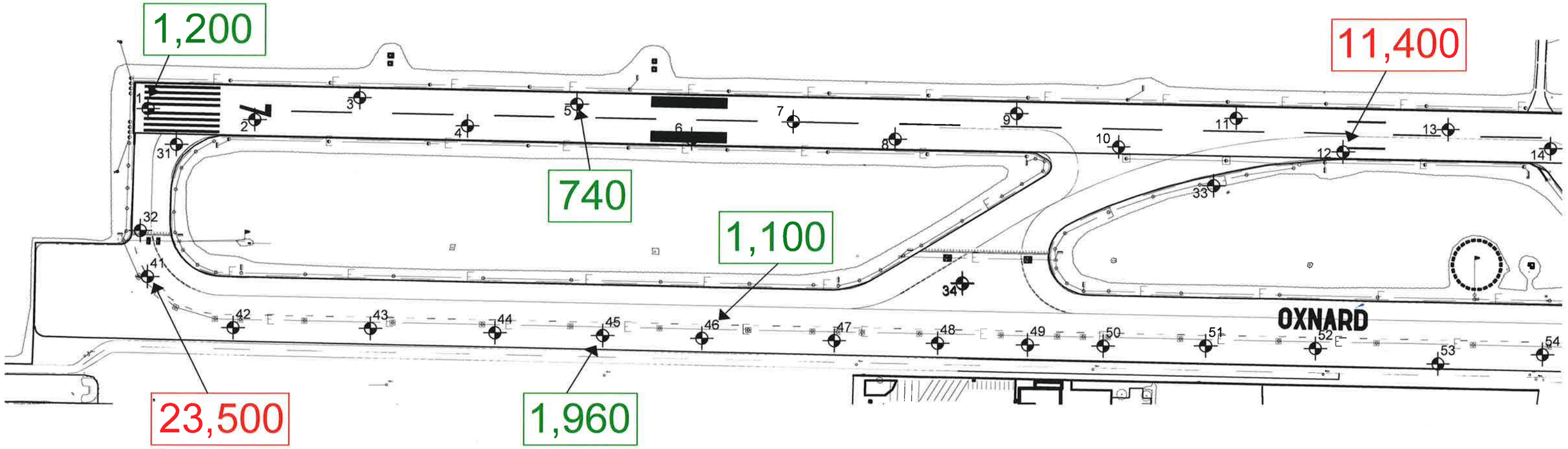
APPENDIX C

Soluble Sulfate Test Results Map

Summary Graph of Swell Test Data



LEGEND

70 Boring Location (Approx.)

23,500 Soluble Sulfate Content of Subgrade Soil (ppm)
Red (≥ 3000ppm) Green (< 3000ppm)

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

N

NOT TO SCALE

OXNARDAIRPORT110518mxps

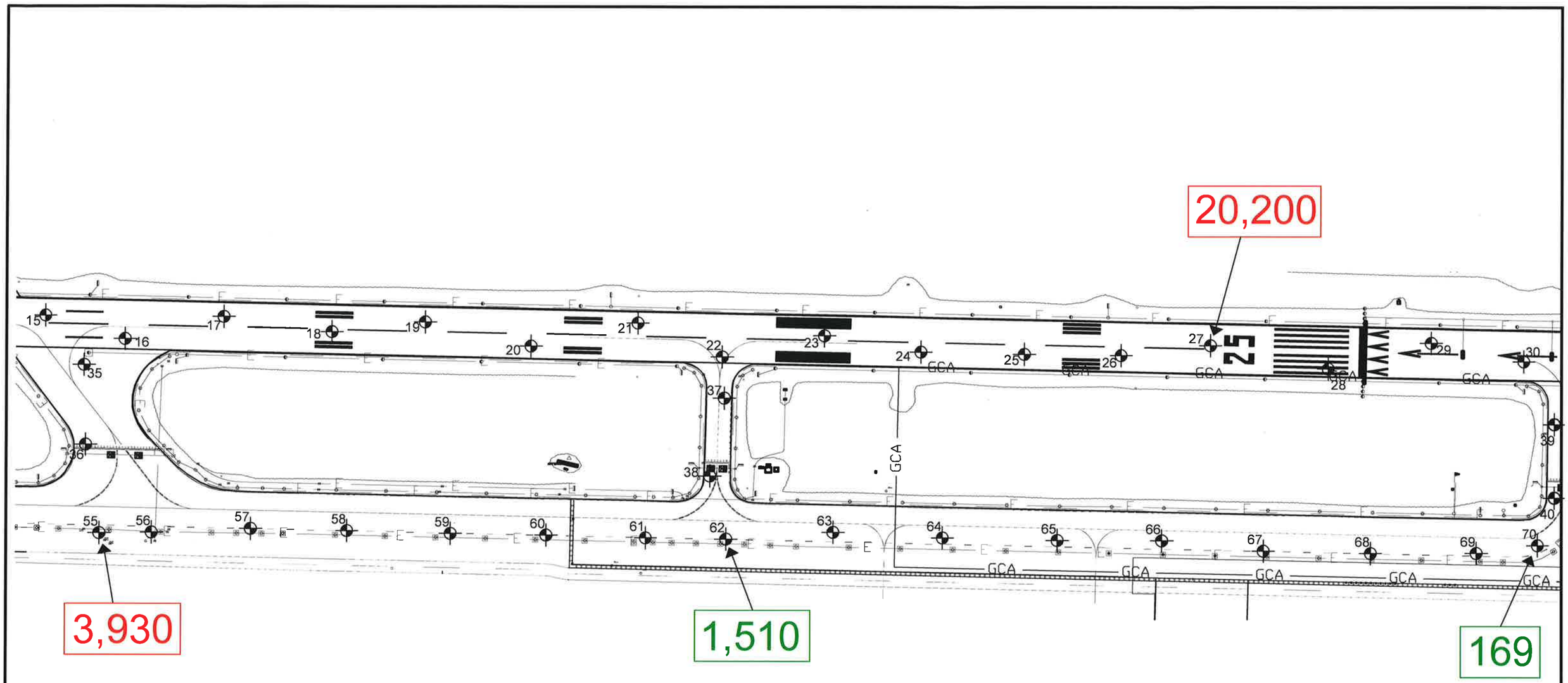
Earth Systems Pacific
4378 Old Santa Fe Road, San Luis Obispo, CA 93401
www.earthsystems.com
(805) 544-3276 • Fax (805) 544-1786

SOLUBLE SULFATE TEST RESULTS MAP

Oxnard Airport Runway 7-25 and Taxiway Connector Improvements
Taxiway F Improvements
Oxnard, California

Date
February 2020

Project No.
302524-001, 002



LEGEND

70 Boring Location (Approx.)

23,500 Soluble Sulfate Content of Subgrade Soil (ppm)
Red (≥ 3000ppm) Green (< 3000ppm)

BASE MAP PROVIDED BY: MEAD AND HUNT, INC

N

NOT TO SCALE

OXNARDAIRPORT110518mxps

Earth Systems Pacific
4378 Old Santa Fe Road, San Luis Obispo, CA 93401
www.earthsystems.com
(805) 544-3276 • Fax (805) 544-1786

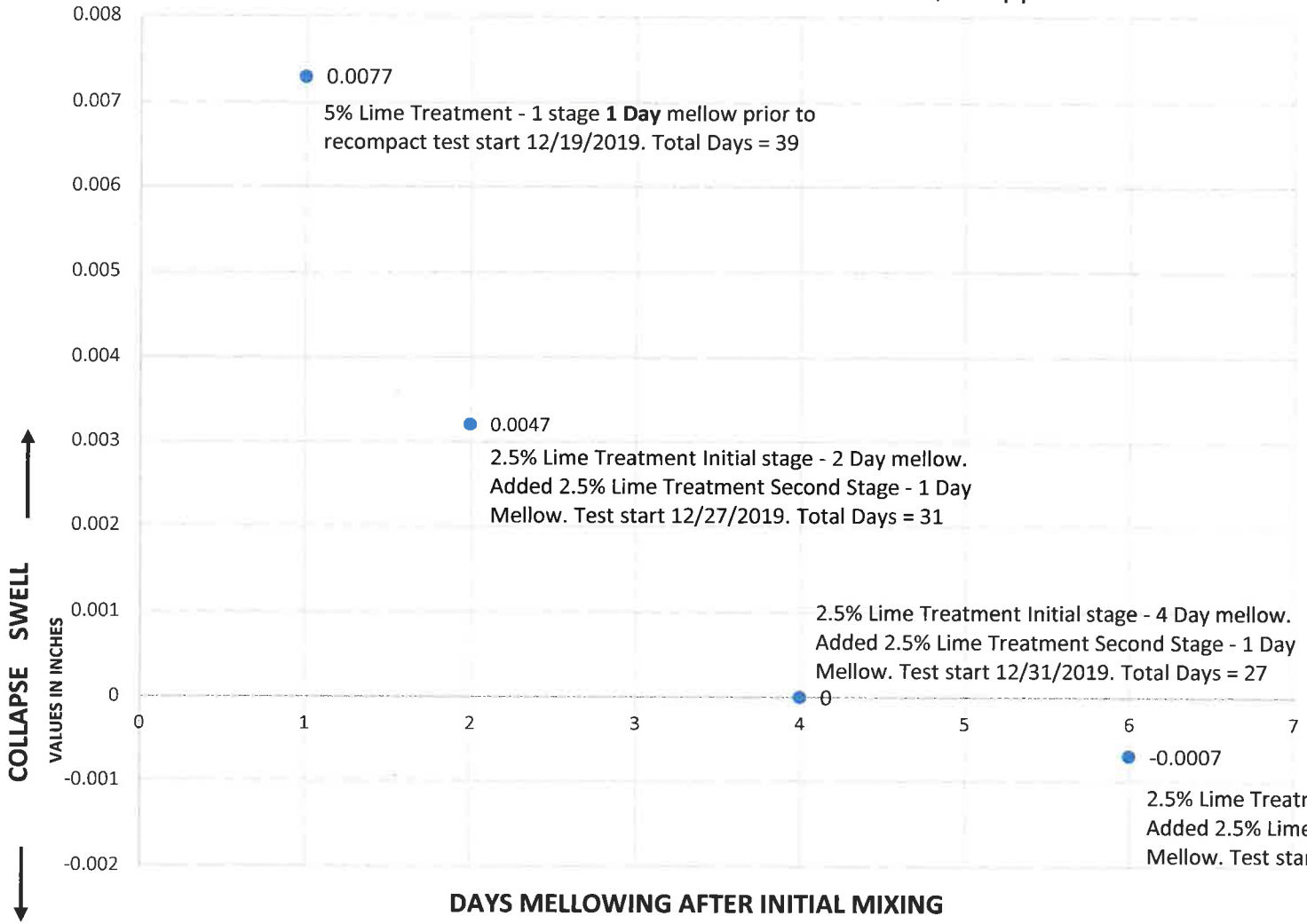
SOLUBLE SULFATE TEST RESULTS MAP

Oxnard Airport Runway 7-25 and Taxiway Connector Improvements
Taxiway F Improvements
Oxnard, California

Date
February 2020

Project No.
302524-001, 002

Oxnard Airport Taxiway F Improvements
Summary of Swell Test Data on Lime Treated Samples as of 1/27/2020
Sample ID: Boring 41 @ 1.5 - 5.0 ft.
Sulfate Content: 23,500 ppm



Notes:

*All samples recompacted at 95% of Maximum Dry Density with 5% lime by dry weight of material at 3% above Optimum Moisture Content.

*100 psf surcharge, fully inundated to start swell test. Swell/collapse values measured after initial collapse under 100 psf surcharge and inundation to initial steady state (min. 2 days no change in readings).

Earth Systems Pacific

4378 Old Santa Fe Road
San Luis Obispo, CA 93401-8116
(805) 544-3276 ◦ FAX (805) 544-1786
E-mail: esp@earthsystems.com

February 21, 2020

File No.: 302524-002 and 001

APPENDIX D

Chain of Custody/Lab Test Request for Samples Sent to HDR, Inc. on 1/16/2020

Laboratory Test Results for Samples Sent to HDR, Inc. on 1/16/2020

HDR

www.hdrinc.com

CHAIN OF CUSTODY & REQUEST FOR LABORATORY TESTING

DATE SENT: 1/16/20

TESTING REQUESTED BY:

Name Fred J. Potthast, GE — Phone: 805-544-3276 x-3

Company Name Earth Systems Pacific — Fax: 805-544-1786

Address 4378 Old Santa Fe Road — Email: fred@earthsystems.com

City San Luis Obispo State CA Zip 93401

SEND RESULTS TO: Same as above

Name Fred J. Potthast, GE

Address Earth Systems Pacific

City San Luis Obispo State CA Zip 93401

Email: fred@earthsystems.com

SEND INVOICE TO: ☑ Same as above

Name

Address

City State Zip

Email:

PROJECT INFORMATION:

P.O. NO: 302524-002 *JOB NAME:* Oxnard Airport - Runway and Taxiway Improvements *JOB NO:* 302524-002

Site Address 2889 West 5th Street

Site City Oxnard Site State CA

TESTS DESIRED:

General Building Materials Corrosivity Testing (resistivity+pH, soluble salts analysis e.g. chlorides, sulfates, ammonium, nitrate)

CalTrans Corrosivity Testing (resistivity+pH per CTM 643, soluble salts analysis with chloride & sulfate per CTM 422 & 417)

Other (Please be specific) Soluable sulfates only - per my phone call 1/16/20 at 0830 with James Keegan

RESULTS DESIRED:

☐ SOIL CORROSIVITY REPORT (with test results)*

☑ TEST RESULTS ONLY (no report)

☐ Expedite turn-around **(additional cost per sample)**. Expedited date required? _____

- **ARE THESE SAMPLES FROM A QUARANTINE AREA?** YES☐ NO☑

Boring ID	Depth	Type of Soil	Boring ID	Depth	Type of Soil
41	1- 5	DkBrn Clayey Sand (SC)	This sample has been	lime treated	at 5% by dry
			weight in 2 stages - 2.5%	mellow for	6 days, then
			another 2.5 %. Total	mellowing	time as of 1/16/20
			is 13 days		

CHAIN OF CUSTODY

Signature	Print Name	Company	Date	Time
Collected/Relinquished By	R. Wagner/S. Hemmer	Earth Systems Pacific	Nov. '18 / Oct '19	PM
Received By:	Terry Reyes	Earth Systems Pacific	Nov. '18 / Oct '19	PM
Relinquished By:	Terry Reyes	Earth Systems Pacific	1/16/20	AM
Received By:				
Relinquished By:				
Received By Laboratory:				

*IF SOIL CORROSIVITY REPORT IS REQUESTED PLEASE FILL OUT PAGE 2

TRANSMITTAL LETTER

DATE: January 27, 2020

ATTENTION: **Fred J. Potthast**

TO: Earth Systems Pacific
4378 Old Santa Fe Road
San Luis Obispo, CA 93401

SUBJECT: Laboratory Test Data
Oxnard Airport - Runway and Taxiway
Your #302524-002, HDR Lab #20-0032LAB

COMMENTS: Enclosed are the results for the subject project.

James T. Keegan, MD
Corrosion and Lab Services Section Manager

431 West Baseline Road · Claremont, CA 91711
Phone: 909.962.5485 · Fax: 909.626.3316

Table 1 - Laboratory Tests on Soil Samples

Earth Systems Pacific
Oxnard Airport - Runway and Taxiway Improvements
Your #302524-002, HDR Lab #20-0032LAB
27-Jan-20

Sample ID			41 @ 1-5 DkBrn Clayey Sand (SC)
Resistivity		**Units**	
as-received		ohm-cm	na
saturated		ohm-cm	na
pH			12.5
Electrical Conductivity		mS/cm	8.30
Chemical Analyses			
Cations			
calcium	Ca^{2+}	mg/kg	4,620
magnesium	Mg^{2+}	mg/kg	23
sodium	Na^{1+}	mg/kg	91
potassium	K^{1+}	mg/kg	38
Anions			
hydroxide	OH^{1-}	mg/kg	3,350
carbonate	CO_3^{2-}	mg/kg	282
bicarbonate	HCO_3^{1-}	mg/kg	ND
fluoride	F^{1-}	mg/kg	95
chloride	Cl^{1-}	mg/kg	29
sulfate	SO_4^{2-}	mg/kg	677
phosphate	PO_4^{3-}	mg/kg	ND
Other Tests			
ammonium	NH_4^{1+}	mg/kg	28
nitrate	NO_3^{1-}	mg/kg	103
sulfide	S^{2-}	qual	na
Redox		mV	na

Resistivity per ASTM G187, Cations per ASTM D6919, Anions per ASTM D4327, and Alkalinity per APHA 2320-B.
Electrical conductivity in millisiemens/cm and chemical analyses were made on a 1:5 soil-to-water extract.
mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

431 West Baseline Road · Claremont, CA 91711
Phone: 909.962.5485 · Fax: 909.626.3316

Attachment 3

Documented Categorical Exclusion

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U.S Department
of Transportation

**Federal Aviation
Administration**

Western-Pacific Region
Office of Airports
Los Angeles Airports District Office

777 S. Aviation Blvd., Suite 150
El Segundo, CA 90245

June 12, 2020

Erin Powers
Projects Administrator
County of Ventura, Dept. of Airports
555 Airport Way, Suite B
Camarillo, CA 93010

Dear Ms. Powers:

Oxnard Airport (OXR)
Pavement Reconstruction of Runway 7-25, Blast Pad, and Connector Taxiways A, B, C, D, and E
Categorical Exclusion Approval

The Federal Aviation Administration (FAA) has determined that the proposed project is Categorically Excluded pursuant to FAA Order 1050.1F, as it relates to the National Environmental Policy Act of 1969, as amended (NEPA). Therefore, no further federal environmental disclosure documentation for this project is necessary for NEPA purposes.

In the event that you do not begin the above identified projects within 3 years, of this Categorical Exclusion Approval, additional environmental review may be necessary (See Section 202(c)(3)(a) of FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*).

This letter notifies you that the proposed project has complied with NEPA only. This is not a notice of final project approval or funding availability.

Feel free to contact me if you have any questions regarding this matter. I can be reached via phone at (424) 405-7269 or email at gail.campos@faa.gov.

Sincerely,

GAIL MARIE CAMPOS

Digitally signed by GAIL MARIE CAMPOS
Date: 2020.06.12 15:18:13 -07'00'

Gail Campos
Environmental Protection Specialist

COUNTY OF VENTURA
OXR CMA
DEPARTMENT OF AIRPORTS

555 AIRPORT WAY, SUITE B
CAMARILLO, CA 93010
PHONE: (805) 388-4274
FAX: (805) 388-4366
WWW.VENTURA.ORG/AIRPORTS
WWW.IFLYOXNARD.COM

June 11, 2020

Ms. Gail Campos
Environmental Protection Specialist, LAX-600.2
Los Angeles Airports District Office (LAX ADO)
Federal Aviation Administration
777 S. Aviation Boulevard, Suite 150
El Segundo, CA 90245

RE: Revalidation of Documented Categorical Exclusion for Pavement Reconstruction of Runway 7-25 and Connector Taxiways A, B, C, D, and E

Dear Ms. Campos:

On February 23, 2019, FAA approved the Documented Categorical Exclusion (CatEx) for the proposed pavement reconstruction of Runway 7-25 and connector taxiways A, B, C, D, and E at Oxnard Airport. Since that time, the project has changed to include reconstruction of the blast pad at the approach end of Runway 25. The current dimensions of the blast pad (120 feet wide and 158 feet long) are non-standard per AC 150/5300-13A, Section 304. Given the airport's Runway Design Code (D-III under 150,000 pounds), the dimensions should be 140 feet wide and 200 feet long. The proposed improvements will also correct the existing blast pad longitudinal grades. Increasing the size of the blast pad will result in an approximate 0.21 acre increase in impervious surface. The additional paved area is not expected to significantly increase runoff and is below the mitigation threshold indicated by the Ventura Technical Guidance Manual for Best Management Practices (BMPs).

The proposed improvements, as shown on the attached exhibit, will be made in areas that were previously disturbed during construction and maintenance of the existing runway at Oxnard Airport. The proposed blast pad improvements will occur in the same project area previously evaluated in the original CatEx submittal and will not disturb native soil. It is not anticipated that revisions to the original responses, additional permits, or additional environmental commitments will be required. Based on the information provided above, I am writing to request your concurrence that the revised proposed project is Categorically Excluded pursuant to FAA Order 1050.1F, Paragraph 5-6.4e, as it relates to the *National Environmental Policy Act of 1969* (NEPA), as amended and no further federal environmental disclosure documentation for this project is necessary for NEPA purposes.

If you have any questions regarding this request, please contact me at 805-388-4205.

Sincerely,

Erin Powers

Erin Powers
Projects Administrator

C. Kory Lewis, Coffman Associates
Judi Krauss, Coffman Associates

COUNTY OF VENTURA
OXR CMA
DEPARTMENT OF AIRPORTS

Teal Club Road

Project Change - Blast Pad

Runway 7-25 5,953' x 100'

N. Victoria Avenue

W 5th Street

S. Patterson Road

S. Ventura Road

E D C B A F

N

0 600

SCALE IN FEET

Photo: Martinez Geospatial May 2018

LEGEND

- Airport Property Line
- Pavement Rehabilitation
- Project Boundary
- Staging Area
- Haul Route
- Not Included in Project Area

Exhibit 1
PROPOSED PROJECT - REVISED

U.S Department
of Transportation
**Federal Aviation
Administration**

Western-Pacific Region
Airports Division
Los Angeles Airports District Office

777 S. Aviation Blvd., Suite 150
El Segundo, CA 90245

February 23, 2019

Mr. Jorge Rubio
Deputy Director of Airports
Department of Airports
555 Airport Way, Suite B
Camarillo, CA 93010

Dear Mr. Rubio:

Oxnard Airport
Pavement Reconstruction of Runway 7-25 and Connector Taxiways A, B, C, D, and E
Categorical Exclusion Approval

The FAA has determined that the proposed project is Categorically Excluded pursuant to FAA Order 1050.1F as it relates to the National Environmental Policy Act of 1969, as amended (NEPA). Therefore, no further federal environmental disclosure documentation for this project is necessary for NEPA purposes.

In the event that you do not begin the above identified projects within 3 years, of this Categorical Exclusion Approval, additional environmental review may be necessary (See Section 202(c)(3)(a) of FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*).

This letter notifies you that the proposed project has complied with NEPA only. This is not a notice of final project approval or funding availability.

Please feel free to call me if you have any questions regarding this matter, I can be reached at 424-405-7269.

Sincerely,

Gail Campos
Environmental Protection Specialist

Documented Categorical Exclusion
(per SOP No. 5.1, Appendix A and FAA Order 1050.1F)

Pavement Reconstruction of Runway 7-25 and Connector Taxiways A, B, C, D, and E
At
Oxnard Airport

Prepared By:

Coffman Associates

On Behalf Of:

Ventura County, California

October 2018

APPENDIX A. DOCUMENTED CATEX

Airport sponsors may use this form for projects eligible for a categorical exclusion (CATEX) that have greater potential for extraordinary circumstances or that otherwise require additional documentation, as described in the Environmental Orders (FAA Order 1050.1F and FAA Order 5050.4B).

To request a CATEX determination from the FAA, the sponsor should review potentially affected environmental resources, review the requirements of the applicable special purpose laws, and **consult with the Airports District Office or Regional Airports Division Office staff** about the type of information needed. The form and supporting documentation should be completed in accordance with the provisions of FAA Order 5050.4B, paragraph 302b, and submitted to the appropriate FAA Airports District/Division Office. The CATEX cannot be approved until all information/documentation is received and all requirements have been fulfilled.

Name of Airport, LOC ID, and location:

Oxnard Airport, OXR, Oxnard, California

Project Title:

Pavement Reconstruction of Runway 7-25 and Connector Taxiways A, B, C, D, and E

Give a brief, but complete description of the proposed project, including all project components, justification, estimated start date, and duration of the project. Include connected actions necessary to implement the proposed project (including but not limited to moving NAVAIDs, change in flight procedures, haul routes, new material or expanded material sources, staging or disposal areas). Attach a sketch or plan of the proposed project. Photos can also be helpful.

Ventura County, as owner and operator of Oxnard Airport, proposes to reconstruct Runway 7-25 and connector taxiways A, B, C, D, and E. Runway 7-25 was last rehabilitated with a rejuvenator seal in 2011 and has not been reconstructed since 1992. The pavement is in fair condition and is exhibiting medium severity weathering and cracking. The connector taxiways were last rehabilitated with a slurry seal in 2011 and have not been reconstructed since 1992. The pavements are in fair-to-poor condition, and are exhibiting medium-to-high severity block cracking.

This project will consist of a full reconstruction of the structural section, including the subgrade. Based on the current assumed fleet mix, the pavement section is anticipated to be composed of 4 inches of P-401 asphaltic concrete (AC) surface course, 5 inches of P-403 AC base course, 6 inches of P-209 crushed aggregate base, and 12 inches of lime-treated subgrade. Also included in the project are airfield electrical improvements for airfield lighting and signing adjustments/ replacement adjacent to the runway and connector taxiways, MS4 stormwater compliance measures and installation of an underdrain system, pavement markings, pavement grooving, and grading improvements. Existing asphalt concrete that is pulverized may remain on-site for use as engineered fill, if needed. All excess material will be hauled off-site.

The project site will be accessed from N. Victoria Avenue on the west and W. 5th Street on the south. The location of the haul route, staging areas, and project site is shown on Exhibit 1 in Attachment 1. Duration of the project will be up to four months.

Give a brief, but complete, description of the proposed project area. Include any unique or natural features within or surrounding airport property.

Oxnard Airport is located approximately two miles west of downtown Oxnard, along West 5th Street in the southwestern quadrant of Ventura County, California. On a regional scale, the airport is located roughly 55 miles west-northwest of Los Angeles and approximately 32 miles southeast of Santa Barbara. Owned and operated by Ventura County, the airport is situated on approximately 230 acres at an elevation of 44.8 feet above mean sea level (MSL). Land to the south and east of the airport is largely urbanized with residential, commercial, and industrial land uses, while land to the north and west of the airport is used for agricultural purposes.

Identify the appropriate CATEX paragraph(s) from Order 1050.1F (paragraph 5-6.1 through 5-6.6) or 5050.4B (Tables 6-1 and 6-2) that apply to the project. Describe if the project differs in any way from the specific language of the CATEX or examples given as described in the Order.

FAA Order 1050.1F, paragraph 5-6.4e - "Federal financial assistance, licensing, or Airport Layout Plan (ALP) approval for the following actions, provided the action would not result in significant erosion or sedimentation, and will not result in a significant noise increase over noise sensitive areas or result in significant impacts on air quality: Reconstruction, resurfacing, extending, strengthening, or widening of an existing runway."

The circumstances one must consider when documenting a CATEX are listed below along with each of the impact categories related to the circumstance. Use FAA Environmental Orders 1050.1F, 5050.4B, and the Desk Reference for Airports Actions, as well as other guidance documents to assist you in determining what information needs to be provided about these resource topics to address potential impacts. Keep in mind that both construction and operational impacts must be included. Indicate whether or not there would be any effects under the particular resource topic and, **if needed**, cite available references to support these conclusions. Additional analyses and inventories can be attached or cited as needed.

5-2.b(1) National Historic Preservation Act (NHPA) resources

	YES	NO
Are there historic/cultural resources listed (or eligible for listing) on the National Register of Historic Places located in the Area of Potential Effect? If yes, provide a record of the historic and/or cultural resources located therein and check with your local Airports Division/District Office to determine if a Section 106 finding is required. *As shown on Exhibit 1, Attachment 1, the project area is currently developed with pavement for the runway and taxiways. The closest historic properties listed on the National Register of Historic Places are the Henry T. Oxnard Historic District and the Oxnard Public Library, located approximately 1.4 and 1.5 miles east of the project site, respectively.*	☐	☒

	YES	NO
Does the project have the potential to cause effects? If yes, describe the nature and extent of the effects. *As shown on Exhibit 1, Attachment 1, the project area is currently developed with pavement for the existing runway and taxiways. The closest historic properties listed on the National Register of Historic Places are the Henry T. Oxnard Historic District and the Oxnard Public Library, located approximately 1.4 and 1.5 miles east of the project site, respectively.*	☐	☒
Is the project area undisturbed? If not, provide information on the prior disturbance (including type and depth of disturbance, if available) The project areas are paved and currently used as aircraft runway or taxiway.	☐	☒
Will the project impact tribal land or land of interest to tribes? If yes, describe the nature and extent of the effects and provide information on the tribe affected. Consultation with their THPO or a tribal representative along with the SHPO may be required. *The entire project is located on County-owned land within airport property.*	☐	☒

5-2.b(2) Department of Transportation Act Section 4(f) and 6(f) resources

	YES	NO
Are there any properties protected under Section 4(f) (as defined by FAA Order 1050.1F) in or near the project area? This includes publicly owned parks, recreation areas, and wildlife or waterfowl refuges of national, state or local significance or land from a historic site of national, state or local significance. *South of the project area, on the south side of W. 5th Street, is Southwest Community Park. Two additional public parks, Seaview Park and Sea Air Park, are located approximately 0.4 mile to the southwest and southeast of the project site, respectively. The closest wilderness area to the project site is the Sespe Wilderness, located 19 miles north of the airport.*	☐	☒

	YES	NO
Will project construction or operation physically or constructively "use" any Section 4(f) resource? If yes, describe the nature and extent of the use and/or impacts, and why there are no prudent and feasible alternatives. See 5050.4B Desk Reference Chapter 7. *No direct impacts to Section 4(f) resources will occur as there are no Section 4(f) resources on the proposed project site. No constructive use or substantial impairment of Section 4(f) resources will occur since no long term noise or other operational effects will adversely impact nearby public recreational uses, including Southwest Community Park.*	☐	☒
Will the project affect any recreational or park land purchased with Section 6(f) Land and Water Conservation Funds? If so, please explain, if there will be impacts to those properties.	☐	☒

5-2.b(3) Threatened or Endangered Species

	YES	NO
Are there any federal or state listed endangered, threatened, or candidate species or designated critical habitat in or near the project area? This includes species protected by individual statute, such as the Bald Eagle. *The project site is fully developed with impervious surfaces and contains no biological resources or habitat for federal or state listed species or designated critical habitat. For purposes of disclosure, Attachment 2 contains the U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC) Trust Resources Report.*	☐	☒
Does the project affect or have the potential to affect, directly or indirectly, any federal or state-listed, threatened, endangered or candidate species, or designated habitat under the Endangered Species Act? If yes, Section 7 consultation between the FAA and the US Fish & Wildlife Service, National Marine Fisheries Service, and/or the appropriate state agency will be necessary. Provide a description of the impacts and how impacts will be avoided, minimized, or mitigated. Provide the Biological Assessment and Biological Opinion, if required.	☐	☒

	YES	NO
Does the project have the potential to take birds protected by the Migratory Bird Treaty Act? Describe steps to avoid, minimize, or mitigate impacts (such as timing windows determined in consultation with the US Fish & Wildlife Service). *There are numerous migratory birds listed by the IPAC database for the general area (Attachment 2). However, the proposed project site does not include habitat, including trees or shrubs, to support these species.* *References: http://ecos.fws.gov/ipac/*	☐	☒

5-2.b (4) Other Resources

Items to consider include:

a. Fish and Wildlife Coordination Act	**YES**	**NO**
Does the project area contain resources protected by the Fish and Wildlife Coordination Act? If yes, describe any impacts and steps taken to avoid, minimize, or mitigate impacts.	☐	☒
b. Wetlands and Other Waters of the U.S.	**YES**	**NO**
Are there any wetlands or other waters of the U.S. in or near the project area? *See Attachment 3.* *Reference: http://www.fws.gov/wetlands/Data/Mapper.html*	☐	☒
Has wetland delineation been completed within the proposed project area? If yes, please provide U.S. Army Corps of Engineers (USACE) correspondence and jurisdictional determination. If delineation was not completed, was a field check done to confirm the presence/absence of wetlands or other waters of the U.S.? If no to both, please explain what methods were used to determine the presence/absence of wetlands.	☐	☒
If wetlands are present, will the project result in impacts, directly or indirectly (including tree clearing)? Describe any steps taken to avoid, minimize or mitigate the impact. *Not applicable.*	☐	☒
Is a USACE Clean Water Act Section 404 permit required? If yes, does the project fall within the parameters of a general permit? If so, which general permit?	☐	☒
c. Floodplains	**YES**	**NO**
Will the project be located in, encroach upon or otherwise impact a floodplain? If yes, describe impacts and any agency coordination or public review completed including coordination with the local floodplain administrator. Attach the FEMA map if applicable and any documentation. *The Airport is identified as Other Flood Areas (Zone X) on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FEMA 2010). This zone is defined by FEMA as, "Areas of 0.2% annual chance flood; areas of 1% annual chance*	☐	☒

flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood." Therefore, significant flooding is not expected to occur on the project site and no increase in impervious surfaces will result from the project. There is a storm drain along W. 5th Street to the south. The area along W. 5th Street south of the Airport is mapped as Zone A, Special Flood Hazard Area Subject to Inundation by the 1% Annual Chance Flood (i.e., 100-year flood) with No Base Elevations determined. See Attachment 4.		
d. Coastal Resources	**YES**	**NO**
Will the project occur in or impact a coastal zone as defined by the State's Coastal Zone Management Plan? If yes, discuss the project's consistency with the State's CZMP. Attach the consistency determination if applicable. *The proposed project site, as well as the Airport itself, is located outside of the California Coastal Zone.* *Reference: https://www.oxnard.org/wp-content/uploads/2017/01/ZoneMap-01.17-AH11x17.pdf*	☐	☒
Will the project occur in or impact the Coastal Barrier Resource System as defined by the US Fish and Wildlife Service?	☐	☒
e. National Marine Sanctuaries	**YES**	**NO**
Is a National Marine Sanctuary located in the project area? If yes, discuss the potential for the project to impact that resource. *The closest National Marine Sanctuary is the Channel Islands National Marine Sanctuary, located 8 miles southwest of the airport.* *Reference: The National Atlas of the United States (United States Geologic Survey [USGS])*	☐	☒
f. Wilderness Areas	**YES**	**NO**
Is a Wilderness Area located in the project area? If yes, discuss the potential for the project to impact that resource. *The closest wilderness area to the project site is the Sespe Wilderness, located 19 miles north of the airport.*	☐	☒
g. Farmland	**YES**	**NO**
Is there prime, unique, state, or locally important farmland in/near the project area? Describe any significant impacts from the project.	☐	☒

As previously noted, the project site consists of land that is paved or maintained for airport use. No farmable land is present.		
Does the project include the acquisition and conversion of farmland? If farmland will be converted, describe coordination with the US Natural Resources Conservation and attach the completed Form AD-1006.	☐	☒
h. Energy Supply and Natural Resources	**YES**	**NO**
Will the project change energy requirements or use consumable natural resources either during construction or during operations? *During construction, fossil fuels would be used to power construction equipment and vehicles. Water would also be used for dust suppression and the washing of construction equipment. Construction of the project would not use energy or natural resources beyond what occurs commonly for this type of development. No changes would occur to energy requirements or use of consumable natural resouces during airport operations due to the project.*	☐	☒
Will the project change aircraft/vehicle traffic patterns that could alter fuel usage either during construction or operations? *The project will not change aircraft/vehicle traffic patterns. Following completion of the improvements, fuel usage is expected to remain consistent with existing usage.*	☐	☒
i. Wild and Scenic Rivers	**YES**	**NO**
Is there a river on the Nationwide Rivers Inventory, a designated river in the National System, or river under State jurisdiction (including study or eligible segments) near the project? *The closest wild or scenic river to the proposed project is a segment of Sespe Creek, located 23 miles northeast; the closest river on the Nationwide Rivers Inventory is the Big Sycamore River, located approximately 12.6 miles southeast.* *Reference: The National Atlas of the United States (USGS); http://www.nps.gov/ncrc/programs/rtca/nri/states/ca.html*	☐	☒
Will the project directly or indirectly affect the river or an area within ¼ mile of its ordinary high water mark?	☐	☒

j. Solid Waste Management	YES	NO
Does the project (either the construction activity or the completed, operational facility) have the potential to generate significant levels of solid waste? If so, discuss how these will be managed. *Existing asphalt concrete that is pulverized may remain on-site for use as engineered fill, if needed. All excess material will be hauled off-site to a landfill that accepts construction waste. No significant levels of solid waste will be generated by the project in the long term.*	☐	☒

5-2.b(5) Disruption of an Established Community

	YES	NO
Will the project disrupt a community, planned development or be inconsistent with plans or goals of the community? *The proposed project is within the boundaries of the airport and will not change the overall existing land uses of the airport and/or project site. No changes to off-site land use or planned development within the surrounding community will occur as a result of the proposed project.*	☐	☒
Are residents or businesses being relocated as part of the project? *All improvements are located on airport property and the project does not include relocation of residents or businesses.*	☐	☒

5-2.b(6) Environmental Justice

	YES	NO
Are there minority and/or low-income populations in/near the project area? *According to the U.S. Census Bureau, the minority population within two miles of the airport is 81 percent. The U.S. Census Bureau also indicates that 41 percent of the population within five miles of the airport are classified as low income. The closest residential area to the project site is approximately one half mile to the south. See Attachment 5.* *Source: U.S. EPA, EJSCREEN, https://ejscreen.epa.gov/mapper/*	☐	☒
Will the project cause any disproportionately high and adverse impacts to minority and/or low-income populations? Attach census data if warranted. *No disproportionately high or adverse impacts to minority and/or low-income populations will occur as a result of the project.*	☐	☒

5-2.b(7) Surface Transportation

	YES	NO
Will the project cause a significant increase in surface traffic congestion or cause a degradation of level of service provided? *No additional long term vehicular traffic would be created from the proposed improvements. Thus, no permanent impacts on the area's circulation system would occur.*	☐	☒
Will the project require a permanent road relocation or closure? If yes, describe the nature and extent of the relocation or closure and indicate if coordination with the agency responsible for the road and emergency services has occurred. *The proposed improvements will occur entirely on airport property and will not require permanent road relocation or closure.*	☐	☒

5-2.b(8) Noise

	YES	NO
Will the project result in an increase in aircraft operations, nighttime operations, or change aircraft fleet mix? *The proposed improvements will not result in a change of aircraft operations, nighttime operations, or change the aircraft fleet mix at the airport.*	☐	☒
Will the project cause a change in airfield configuration, runway use, or flight patterns either during construction or after the project is implemented?	☐	☒
Does the forecast exceed 90,000 annual propeller operations, 700 annual jet operations or 10 daily helicopter operations or a combination of the above? If yes, a noise analysis may be required if the project would result in a change in operations. *FAA's Terminal Area Forecast, issued January 2018, projects annual operations will be 75,053 in 2038.* *Reference: https://aspm.faa.gov/main/taf.a*	☐	☒
Has a noise analysis been conducted, including but not limited to generated noise contours, a specific point analysis, area equivalent method analysis, or other screening method. If yes, provide that documentation.	☐	☒

	YES	NO
Could the project have a significant impact (DNL 1.5 dB or greater increase) on noise levels over noise sensitive areas within the 65+ DNL noise contour? *See previous responses. The proposed project will not result in a change in airport operations. In addition, there are no sensitive noise receptors within 0.2 mile of the proposed project that will be adversely affected by temporary, short term, construction noise.*	☐	☒

5-2.b(9) Air Quality

	YES	NO
Is the project located in a Clean Air Act non-attainment or maintenance area? *The airport is located in Ventura County which is designated as a nonattainment area for ozone.*	☒	☐
If yes, is it listed as exempt, presumed to conform or will emissions (including construction emissions) from the project be below *de minimis* levels (provide the paragraph citation for the exemption or presumed to conform list below, if applicable) Is the project accounted for in the State Implementation Plan or specifically exempted? Attach documentation. *As outlined in Federal Register, Vol. 72, No. 145, Federal Aviation Administration Federal Presumed to Conform Actions Under General Conformity, airport maintenance, repair, removal, replacement, and installation work that matches the characteristics, size, and function of a facility as it existed before the replacement or repair activity typically qualifies as routine maintenance and repair for purposes of general conformity. Such activity does not increase the capacity of the airport or change the operational environment of the airport.* *The proposed project meets the definition of routine maintenance and repair and is presumed to conform as it will match the characteristics, size and function of the existing runway and taxiway system.*	☒	☐
Does the project have the potential to increase landside or airside capacity, including an increase of surface vehicles?	☐	☒
Could the project impact air quality or violate local, State, Tribal or Federal air quality standards under the Clean Air Act Amendments of 1990 either during construction or operations?	☐	☒

5-2.b (10) Water Quality

	YES	NO
Are there water resources within or near the project area? These include groundwater, surface water (lakes, rivers, etc.), sole source aquifers, and public water supply. If yes, provide a description of the resource, including the location (distance from project site, etc.). *There are no surface waters in proximity to the proposed project site, including any impaired waters under the Clean Water Act; the closest sole source aquifer is the Fresno County sole source aquifer, located approximately 155 miles north. However, the City's public water sources include both local groundwater (Oxnard Plain Basin) and imported water from the Calleguas Municipal Water District, which purchases State Project Water. The City has adopted a long-range water supply strategy, known as the Groundwater Recovery Enhancement and Treatment (GREAT) Program, which combines wastewater recycling, groundwater injection, and groundwater desalination to make more efficient use of existing local water resources to meet projected water supply needs.* *References: The National Atlas of the United States (USGS); City of Oxnard 2030 General Plan Goals and Policies (2011).*	☐	☒
Will the project impact any of the identified water resources either during construction or operations? Describe any steps that will be taken to protect water resources during and after construction. *The contractor would be required to implement best management practices (BMPs) during all construction activity (FAA AC 150/5370-10G, Item P-156). Implementation of these measures during construction would ensure that no significant impacts to water quality occur.*	☐	☒
Will the project increase the amount or rate of stormwater runoff either during construction or during operations? Describe any steps that will be taken to ensure it will not impact water quality. *The proposed project includes reconstruction of existing pavement. The amount or rate of stormwater runoff will not change during or following construction.*	☐	☒
Does the project have the potential to violate federal, state, tribal or local water quality standards established under the Clean Water and Safe Drinking Water Acts? *See previous responses. The contractor would be required to implement BMPs during all construction activity (FAA Order 1050.1F, Paragraph 5-6.4o and FAA AC 150/5370-10G, Item P-156).*	☐	☒
Are any water quality related permits required? If yes, list the appropriate permits.	☒	☐

	YES	NO
Coverage under the State Water Resource Control Board (SWRCB) NPDES General Construction permit for small construction activities will be required since the project disturbance area is more than one acre.		

5-2.b(11) Highly Controversial on Environmental Grounds

	YES	NO
Is the project highly controversial? The term "highly controversial" means a substantial dispute exists as to the size, nature, or effect of a proposed federal action. The effects of an action are considered highly controversial when reasonable disagreement exists over the project's risks of causing environmental harm. Mere opposition to a project is not sufficient to be considered highly controversial on environmental grounds. Opposition on environmental grounds by a federal, state, or local government agency or by a tribe or a substantial number of the persons affected by the action should be considered in determining whether or not reasonable disagreement exists regarding the effects of a proposed action.	☐	☒

5-2.b(12) Inconsistent with Federal, State, Tribal or Local Law

	YES	NO
Will the project be inconsistent with plans, goals, policy, zoning, or local controls that have been adopted for the area in which the airport is located? *The proposed improvements will occur entirely on airport property and will enhance safety at the airport. The proposed improvements at the airport are consistent with the airport master plan adopted by Ventura County.*	☐	☒
Is the project incompatible with surrounding land uses? *The proposed improvements would not change the nature of the operations at the airport.*	☐	☒

5-2 .b (13) Light Emissions, Visual Effects, and Hazardous Materials

a. Light Emissions and Visual Effects	YES	NO
Will the proposed project produce light emission impacts? *The existing runway and taxiway edge lighting will be replaced with similar lighting systems. There will be no substantial change in airfield lighting as a result of the porposed improvements.*	☐	☒

Will there be visual or aesthetic impacts as a result of the proposed project and/or have there been concerns expressed about visual/aesthetic impacts? *The proposed improvements will occur at ground level and will be similar to the existing appearance of the airport in this area. No concerns have been expressed regarding the visual or aesthetic changes resulting from the proposed improvements.*	☐	☒
b. Hazardous Materials	**YES**	**NO**
Does the project involve or affect hazardous materials? *Construction of the proposed improvements may involve common hazardous materials, such as fossil fuels for construction equipment and vehicles. All construction activity would be subject to existing permit procedures for the handling, transporting, and disposal of such materials. The contractor would follow standard hazardous materials containment procedures and BMPs should an inadvertent spill occur. If previously unknown contaminants are discovered during construction, or a spill occurs during construction, work would be halted and the National Response Center notified.*	☐	☒
Will construction take place in an area that contains or previously contained hazardous materials? *According to the U.S. Environmental Protection Agency's EJSCREEN website, there are no Superfund sites or brownfields near the airport (see Attachment 5).*	☐	☒
If the project involves land acquisition, is there a potential for this land to contain hazardous materials or contaminants? *Not applicable. The project does not involve land acquisition.*	☐	☒
Will the proposed project produce hazardous and/or solid waste either during construction or after? If yes, how will the additional waste be handled? *No hazardous or solid waste will be generated by the project in the long term. Solid waste from construction activity will be removed from the site and disposed of properly.*	☐	☒

5-2 .b (14) Public Involvement

	YES	NO
Was there any public notification or involvement? If yes, provide documentation.	☐	☒

5-2 .b (15) Indirect/Secondary/Induced Impacts

	YES	NO
Will the project result in indirect/secondary/induced impacts? *The proposed improvements would enhance safety at the airport and are not anticipated to induce growth or result in changes in land use, population density, or growth rate.*	☐	☒
When considered with other past, present, and reasonably foreseeable future projects, on or off airport property and regardless of funding source, would the proposed project result in a significant cumulative impact? *In the next five years, the Ventura County plans to reconstruct the east apron and a portion fo the transient apron, reconstruct the terminal Apron, rehabilitate the central and west hangar areas and ARFF apron, and rehabilitate the perimeter and terminal loop roads. Additionally, a private entity plans to construct a hangar at the airport. These projects will be subject to additional environmental review and any potential impacts associated with the projects would be mitigated during their implementation to reduce impacts.* *The proposed runway and taxiway reconstruction project, when considered with these improvements, will not cause significant cumulative impacts. All project activities will be contained on airport property and cumulative impacts in conjunction with other projects will not occur.* *With regards to cumulative climate change, the proposed project will not generate new greenhouse gases (GHGs) as no changes to the site's existing use will occur in the foreseeable future..*	☐	☒

Permits

List any permits required for the proposed project that have not been previously discussed. Provide details on the status of permits.

Coverage under the previously discussed SWRCB NPDES General Construction permit is required. This includes preparation of a SWPPP and filing a Notice of Intent with SWRCB.

Environmental Commitments

List all measures and commitments made to avoid, minimize, mitigate, and compensate for impacts on the environment, which are needed for this project to qualify for a CATEX.

California state law requires that if archaeological materials are encountered during construction activities, work in the vicinity of the find shall be halted and a qualified archaeologist shall be consulted to determine the appropriate treatment of the discovery (14 CCR, Chapter 3, Section 15064.5(f)).

The Sponsor will ensure that the project contractor follows BMPs during construction including those identified in FAA AC 150/5370-10G, Item P-156 and measures contained in the airport and project-specific SWPPPs.

The contractor will follow standard hazardous materials containment procedures and BMPs should an inadvertent spill occur. If previously unknown contaminants are discovered during construction, or a spill occurs during construction, work will be halted and the National Response Center notified.

Preparer Information

Point of Contact: Kory Lewis		
Address: 237 NW Blue Parkway, Suite 100		
City: Lee's Summit	**State:** MO	**Zip Code:** 64063
Phone: 816-524-3500	**Email Address:** klewis@coffmanassociates.com	

Signature: _____ Date: 10/11/2018

Airport Sponsor Information and Certification (may not be delegated to consultant)

Provide contact information for the designated sponsor point of contact and any other individuals requiring notification of the FAA decision.

Point of Contact: Erin Powers, Projects Administrator		
Address: 555 Airport Way, Suite B		
City: Camarillo	**State:** CA	**Zip Code:** 93010
Phone Number: 805-388-4205	**Email Address**: erin.powers@ventura.org	
Additional Name(s):	**Additional Email Address(es):**	

I certify that the information I have provided above is, to the best of my knowledge, correct. I also recognize and agree that no construction activity, including but not limited to site preparation, demolition, or land disturbance, shall proceed for the above proposed project(s) until FAA issues a final environmental decision for the proposed project(s) and until compliance with all other applicable FAA approval actions (e.g., ALP approval, airspace approval, grant approval) has occurred.

Signature: _____ Date: 10/11/2018

FAA Decision

Having reviewed the above information, it is the FAA's decision that the proposed project (s) or development warrants environmental processing as indicated below.

Name of Airport, LOC ID, and location:

Oxnard Airport, OXR, Oxnard, California

Project Title:

Pavement Reconstruction of Runway 7-25 and Connector Taxiways A, B, C, D, and E

☐ No further NEPA review required. Project is categorically excluded per (cite applicable 1050.1.F CATEX that applies:)

☐..An Environmental Assessment (EA) is required.

☐..An Environmental Impact Statement (EIS) is required.

☐..The following additional documentation is necessary for FAA to perform a complete environmental evaluation of the proposed project.

Name: Title:

Responsible FAA Official

Signature: _____ Date:

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Attachment 1

Proposed Project Exhibit

COUNTY OF VENTURA
OXR CMA
DEPARTMENT OF AIRPORTS

Exhibit 1
PROPOSED PROJECT

Attachment 2

Biological Information

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

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Location

Ventura County, California

Local office

Ventura Fish And Wildlife Office

(805) 644-1766
(805) 644-3958

2493 Portola Road, Suite B
Ventura, CA 93003-7726

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS

California Least Tern Sterna antillarum browni — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/8104

Least Bell's Vireo Vireo bellii pusillus — Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/5945

Light-footed Clapper Rail Rallus longirostris levipes — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/6035

Marbled Murrelet Brachyramphus marmoratus — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/4467

Southwestern Willow Flycatcher Empidonax traillii extimus — Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/6749

Western Snowy Plover Charadrius nivosus nivosus — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/8035

Amphibians

NAME	STATUS
California Red-legged Frog Rana draytonii There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2891	Threatened

Fishes

NAME	STATUS
Tidewater Goby Eucyclogobius newberryi There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/57	Endangered

Crustaceans

NAME	STATUS

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Riverside Fairy Shrimp Streptocephalus woottoni — Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/8148

Vernal Pool Fairy Shrimp Branchinecta lynchi — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/498

Flowering Plants

NAME	STATUS

California Orcutt Grass Orcuttia californica — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4923

Gambel's Watercress Rorippa gambellii — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4201

Marsh Sandwort Arenaria paludicola — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/2229

Salt Marsh Bird's-beak Cordylanthus maritimus ssp. maritimus — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/6447

Spreading Navarretia Navarretia fossalis — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/1334

Ventura Marsh Milk-vetch Astragalus pycnostachyus var. lanosissimus — Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/1160

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

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THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED,

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WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Allen's Hummingbird Selasphorus sasin This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9637	Breeds Feb 1 to Jul 15
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Aug 31
Black Oystercatcher Haematopus bachmani This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9591	Breeds Apr 15 to Oct 31
Black Skimmer Rynchops niger This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15
Black Turnstone Arenaria melanocephala This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Clark's Grebe Aechmophorus clarkii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jan 1 to Dec 31
Common Yellowthroat Geothlypis trichas sinuosa This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/2084	Breeds May 20 to Jul 31
Long-billed Curlew Numenius americanus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5511	Breeds elsewhere

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Marbled Godwit Limosa fedoa — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9481

Nuttall's Woodpecker Picoides nuttallii — Breeds Apr 1 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9410

Oak Titmouse Baeolophus inornatus — Breeds Mar 15 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9656

Rufous Hummingbird selasphorus rufus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Short-billed Dowitcher Limnodromus griseus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9480

Song Sparrow Melospiza melodia — Breeds Feb 20 to Sep 5
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Spotted Towhee Pipilo maculatus clementae — Breeds Apr 15 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/4243

Tricolored Blackbird Agelaius tricolor — Breeds Mar 15 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3910

Whimbrel Numenius phaeopus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9483

Willet Tringa semipalmata — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

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Wrentit Chamaea fasciata — Breeds Mar 15 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

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Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

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Song Sparrow
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

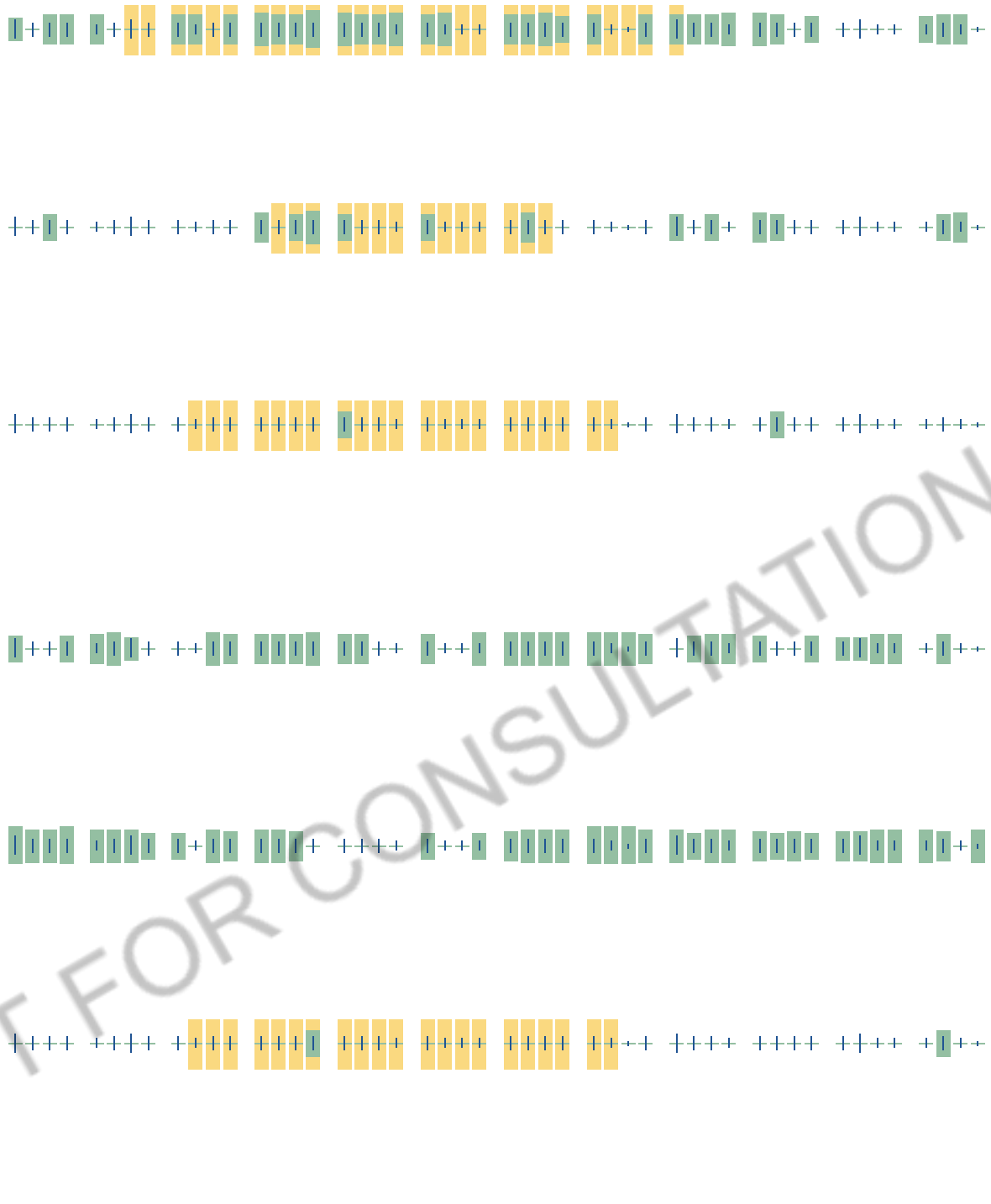
Spotted Towhee
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Tricolored Blackbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Whimbrel
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Willet
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Wrentit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



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Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review.

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Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

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Facilities

Wildlife refuges and fish hatcheries

REFUGE AND FISH HATCHERY INFORMATION IS NOT AVAILABLE AT THIS TIME

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

THERE ARE NO KNOWN WETLANDS AT THIS LOCATION.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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Attachment 3

Water Resources

U.S. Fish and Wildlife Service

National Wetlands Inventory

Oxnard Airport

October 4, 2018

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Attachment 4

Floodplains

drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1994 or later.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to confirm to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

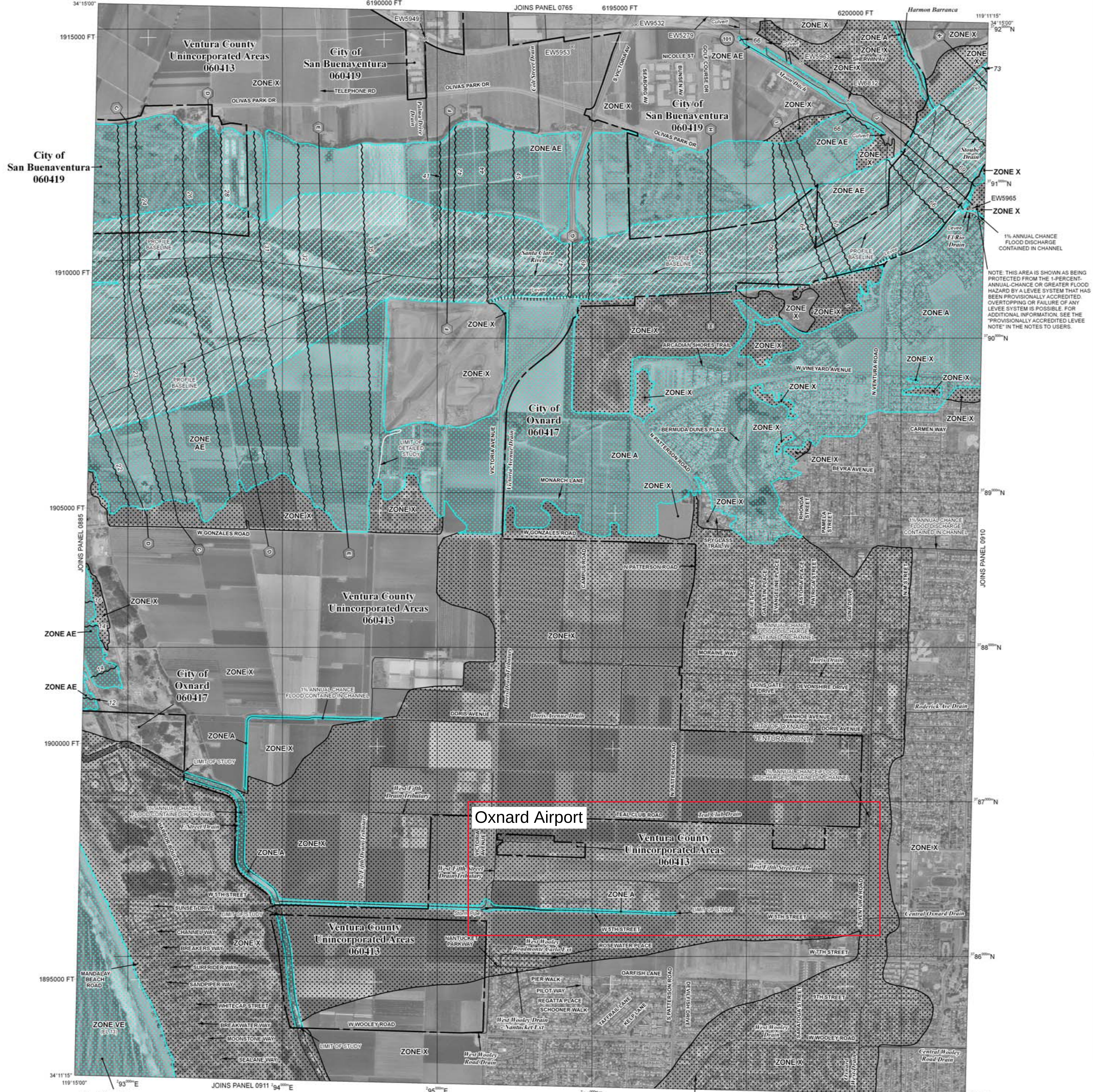
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.mcs.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.

Provisionally Accredited Levee Notes to Users: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations by December 1, 2009. If the community or owner does not provide the necessary data and documentation or if the data and documentation provided indicate the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de-accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at http://www.fema.gov/business/nfip/index.shtm.



The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

Ⓐ———Ⓐ	Cross section line
㉓- - - -㉓	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4276000m N	1000-meter Universal Transverse Mercator grid values, zone 11
600000 FT	5000-foot grid ticks: California State Plane coordinate system, zone V (FIPSZONE 0405), Lambert Conformal Conic projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
January 20, 2010

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0905E

FIRM
FLOOD INSURANCE RATE MAP

VENTURA COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 905 OF 1275
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
OXNARD, CITY OF	060417	0905	E
SAN BUENAVENTURA, CITY OF	060419	0905	E
VENTURA COUNTY	060413	0905	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06111C0905E

EFFECTIVE DATE
JANUARY 20, 2010

Attachment 5

United States Census Bureau

American Community Survey Data

(U.S. EPA EJScreen website)

EJSCREEN Report (Version 2018)

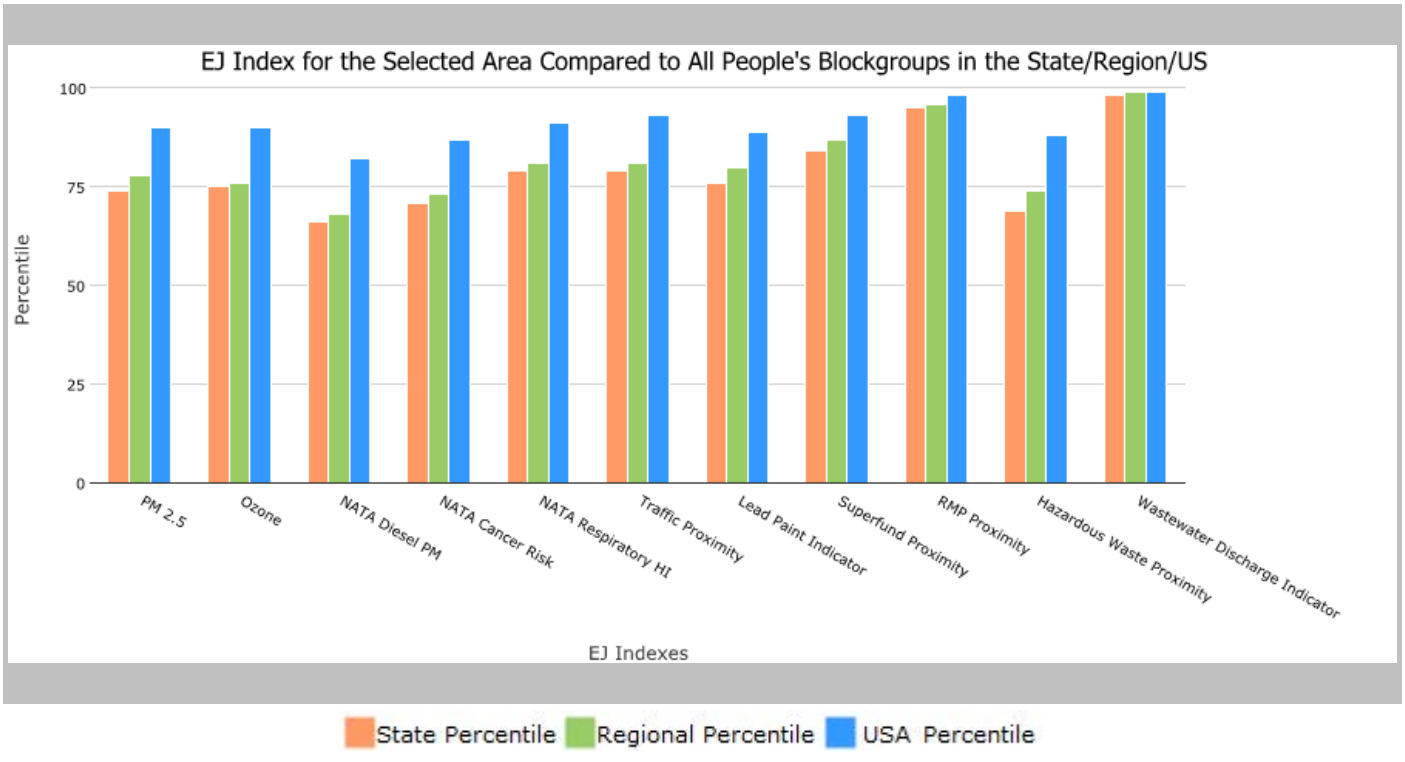
2 mile Ring Centered at 34.200413,-119.207611, CALIFORNIA, EPA Region 9

Approximate Population: 84,372

Input Area (sq. miles): 12.56

Oxnard Airport

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	74	78	90
EJ Index for Ozone	75	76	90
EJ Index for NATA* Diesel PM	66	68	82
EJ Index for NATA* Air Toxics Cancer Risk	71	73	87
EJ Index for NATA* Respiratory Hazard Index	79	81	91
EJ Index for Traffic Proximity and Volume	79	81	93
EJ Index for Lead Paint Indicator	76	80	89
EJ Index for Superfund Proximity	84	87	93
EJ Index for RMP Proximity	95	96	98
EJ Index for Hazardous Waste Proximity	69	74	88
EJ Index for Wastewater Discharge Indicator	98	99	99



This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

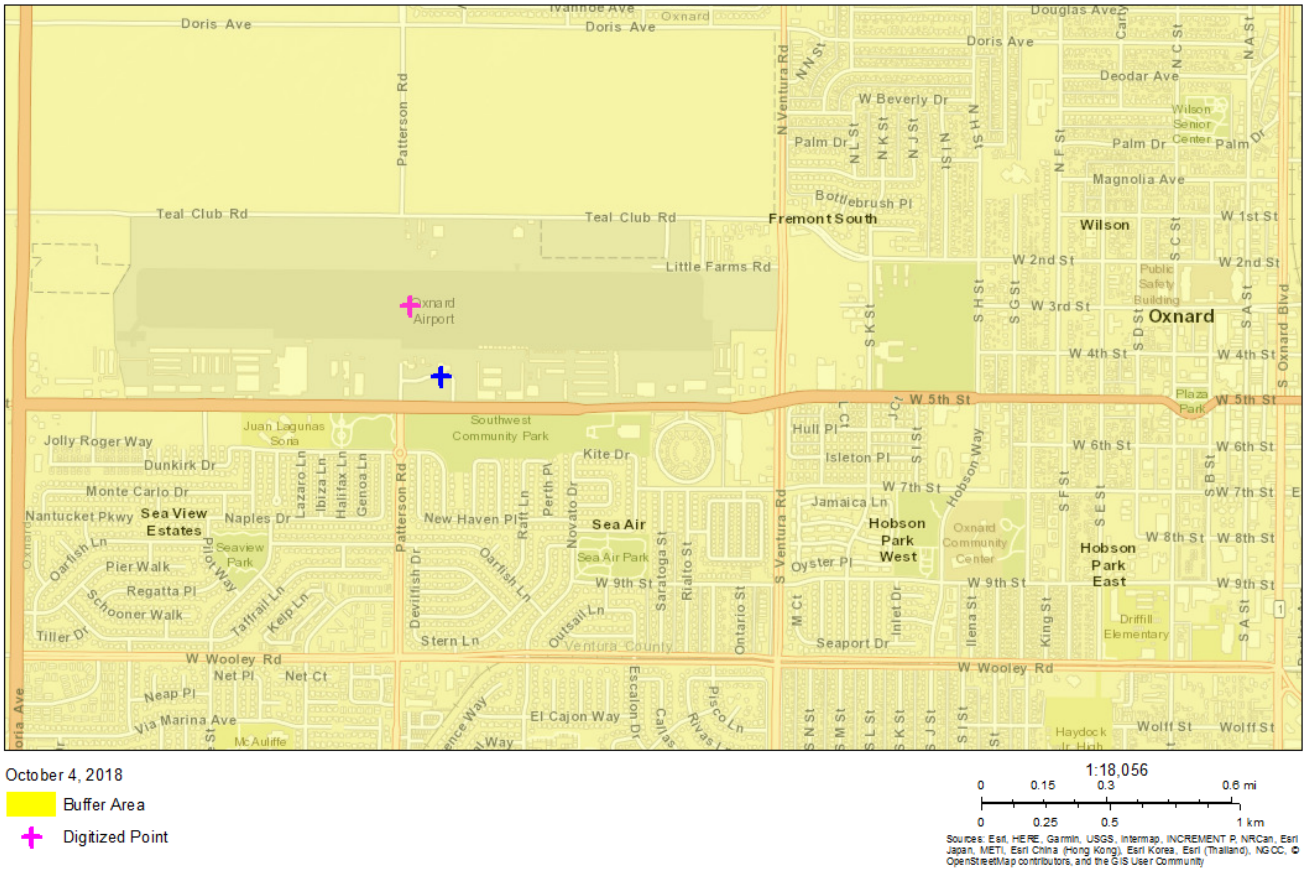
EJSCREEN Report (Version 2018)

2 mile Ring Centered at 34.200413,-119.207611, CALIFORNIA, EPA Region 9

Approximate Population: 84,372

Input Area (sq. miles): 12.56

Oxnard Airport



Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0

EJSCREEN Report (Version 2018)

2 mile Ring Centered at 34.200413,-119.207611, CALIFORNIA, EPA Region 9

Approximate Population: 84,372

Input Area (sq. miles): 12.56

Oxnard Airport

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in µg/m^3)	9.59	10.7	36	10.1	48	9.53	48
Ozone (ppb)	41.4	47.4	30	48.3	24	42.5	39
NATA* Diesel PM (µg/m^3)	0.575	0.972	31	0.978	<50th	0.938	<50th
NATA* Cancer Risk (lifetime risk per million)	34	44	18	43	<50th	40	<50th
NATA* Respiratory Hazard Index	2.1	2.1	57	2	60-70th	1.8	70-80th
Traffic Proximity and Volume (daily traffic count/distance to road)	640	1200	60	1100	63	600	81
Lead Paint Indicator (% Pre-1960 Housing)	0.21	0.29	50	0.24	58	0.29	53
Superfund Proximity (site count/km distance)	0.14	0.17	74	0.14	78	0.12	80
RMP Proximity (facility count/km distance)	4.1	1.1	95	0.97	96	0.72	98
Hazardous Waste Proximity (facility count/km distance)	1.3	3.3	43	2.8	52	4.3	69
Wastewater Discharge Indicator (toxicity-weighted concentration/m distance)	170	16	99	12	99	30	99
Demographic Indicators							
Demographic Index	61%	48%	68	47%	71	36%	82
Minority Population	81%	62%	67	59%	70	38%	84
Low Income Population	41%	35%	63	35%	63	34%	67
Linguistically Isolated Population	12%	9%	68	8%	72	4%	87
Population With Less Than High School Education	28%	18%	73	17%	76	13%	88
Population Under 5 years of age	7%	6%	59	6%	59	6%	63
Population over 64 years of age	12%	13%	53	13%	52	14%	42

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

For additional information, see: www.epa.gov/environmentaljustice

EJSCREEN is a screening tool for pre-decisional use only. It can help identify areas that may warrant additional consideration, analysis, or outreach. It does not provide a basis for decision-making, but it may help identify potential areas of EJ concern. Users should keep in mind that screening tools are subject to substantial uncertainty in their demographic and environmental data, particularly when looking at small geographic areas. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports. This screening tool does not provide data on every environmental impact and demographic factor that may be relevant to a particular location. EJSCREEN outputs should be supplemented with additional information and local knowledge before taking any action to address potential EJ concerns.

U.S Department
of Transportation

**Federal Aviation
Administration**

Western-Pacific Region
Office of Airports
Los Angeles Airports District Office

777 S. Aviation Blvd., Suite 150
El Segundo, CA 90245

January 27, 2021

Erin Powers
Projects Administrator
County of Ventura, Dept. of Airports
555 Airport Way, Suite B
Camarillo, CA 93010

Dear Ms. Powers:

Oxnard Airport (OXR)
Taxiway F Reconstruction
Categorical Exclusion Approval

The Federal Aviation Administration (FAA) has determined that the proposed project is Categorically Excluded pursuant to FAA Order 1050.1F, as it relates to the National Environmental Policy Act of 1969, as amended (NEPA). Therefore, no further federal environmental disclosure documentation for this project is necessary for NEPA purposes.

In the event that you do not begin the above identified projects within 3 years, of this Categorical Exclusion Approval, additional environmental review may be necessary (See Section 202(c)(3)(a) of FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions*).

This letter notifies you that the proposed project has complied with NEPA only. This is not a notice of final project approval or funding availability.

Feel free to contact me if you have any questions regarding this matter. I can be reached via phone at (424) 405-7269 or email at gail.campos@faa.gov.

Sincerely,

GAIL MARIE CAMPOS

Digitally signed by GAIL MARIE CAMPOS
Date: 2021.01.27 17:25:32 -08'00'

Gail Campos
Environmental Protection Specialist

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Documented Categorical Exclusion
(per SOP No. 5.1, Appendix A and FAA Order 1050.1F)

Taxiway F Reconstruction
At
Oxnard Airport

Prepared By:

Coffman Associates

On Behalf Of:

Ventura County, California
Department of Airports

July 2020

APPENDIX A. DOCUMENTED CATEX

Airport sponsors may use this form for projects eligible for a categorical exclusion (CATEX) that have greater potential for extraordinary circumstances or that otherwise require additional documentation, as described in the Environmental Orders (FAA Order 1050.1F and FAA Order 5050.4B).

To request a CATEX determination from the FAA, the sponsor should review potentially affected environmental resources, review the requirements of the applicable special purpose laws, and **consult with the Airports District Office or Regional Airports Division Office staff** about the type of information needed. The form and supporting documentation should be completed in accordance with the provisions of FAA Order 5050.4B, paragraph 302b, and submitted to the appropriate FAA Airports District/Division Office. The CATEX cannot be approved until all information/documentation is received and all requirements have been fulfilled.

Name of Airport, LOC ID, and location:

Oxnard Airport (OXR)

2889 W. 5th Street

Oxnard, CA 93030

Project Title:

Taxiway F Reconstruction

Give a brief, but complete description of the proposed project, including all project components, justification, estimated start date, and duration of the project. Include connected actions necessary to implement the proposed project (including but not limited to moving NAVAIDs, change in flight procedures, haul routes, new material or expanded material sources, staging or disposal areas). Attach a sketch or plan of the proposed project. Photos can also be helpful.

The Proposed Action involves the relocation of Taxiway F 35 feet (ft) to the south and pavement reconstruction to enhance the pavement strength to support aircraft traffic. Taxiway F is a parallel taxiway, is currently 365 ft from the centerline of Runway 7-25 (a D-III runway), and does not comply with Federal Aviation Administration (FAA) D-III runway/taxiway separation safety standards (Advisory Circular 150/5300-13A, Airport Design). Relocating the taxiway 35 ft to the south will offer the standard 400-foot centerline-to-centerline separation between the taxiway and runway. Taxiway F is approximately 5,953 ft in length and 70 ft in width.

The relocation of Taxiway F will involve assimilating a portion of the existing aircraft parking apron, which is not structurally designed to withstand the use as a taxiway, including the subgrade. Therefore, it will be necessary to reconstruct the current apron pavement to taxiway standards. Once complete, Taxiway F will be 50 ft in width. Additional activities associated with the Proposed Action will include painting the taxiway with appropriate markings, removing and relocating taxiway in-pavement and edge lighting (including infrastructure) and taxiway signage, and the use of an on-airport staging area and haul route.

The existing taxiway and apron demolition and removals will include the excavation of asphaltic concrete (AC) surface ranging in depth between 2 inches (in.) to 6 in., and base ranging between 2.5 in. to 10 in., for a maximum excavation of 16 in. Demolished AC will either be exported off-site for use by the Contractor or will be hauled to a solid waste facility which accepts construction waste. The maximum volume of material excavated will be approximately 29,600 cubic yards (cy).

Based on a draft preliminary design report, the new pavement section will be composed of 4 in. of AC surface, 9 in. of crushed aggregate base, and 16 in. of lime-treated subgrade. A new taxiway shoulder, not to exceed 15 ft in width, will be constructed using the crushed AC material from the taxiway/apron demolition or new aggregate base.

The Proposed Action includes airfield electrical improvements for taxiway lighting, signage adjustments/ replacement adjacent to the taxiway, and pavement markings. The lighting will be an in-kind replacement of the fixtures. Existing lighting fixtures along the south edge of Taxiway F are in-pavement, light-emitting diode (LED) fixtures. The existing infrastructure for the in-pavement lighting will be removed and disposed. New lighting and electrical infrastructure will be installed for new in-pavement LED light fixtures once the new taxiway location is established. New LED lighting along the north edge of Taxiway F will be placed within the shoulder. Signage will also be an in-kind replacement.

Haul routes for the Proposed Action will be by paved access roads from N. Victoria Avenue on the west, W. 5th Street on the south, and Teal Club Road to the north. The staging area is proposed to be located within an undeveloped area west of the Proposed Action, adjacent to N. Victoria Ave. The staging area has been previously disturbed by past airport activities and is continually maintained by the airport. The location of the haul route, staging areas, and project site are shown on ***Attachment 1.***

The Proposed Action is anticipated to be completed during the reconstruction of Runway 7-25 and connecting Taxiways A, B, C, D, and E, and the pavement rehabilitation of the east and transient aprons (CATEXs previously approved by FAA on February 23, 2019 and November 6, 2018, respectively). Due to the complexity of the runway project, the airport will be closed to air traffic for an estimated maximum time frame of 90 days, which will allow the total reconstruction of Runway 7-25 and connecting taxiways. The relocation and reconstruction of Taxiway F is anticipated to take approximately 45 days to complete and is expected to occur in conjunction of the Runway 7-25 reconstruction project. Anticipated start date for the Proposed Action is June 2021.

Give a brief, but complete, description of the proposed project area. Include any unique or natural features within or surrounding airport property.

Oxnard Airport is located approximately two miles west of downtown Oxnard, along West 5th Street in the southwestern quadrant of Ventura County, California. On a regional scale, the airport is located roughly 55 miles west-northwest of Los Angeles and approximately 32 miles southeast of Santa Barbara. Owned and operated by Ventura County, the airport is situated on approximately 230 acres at an elevation of 44.8 feet above mean sea level (MSL). Land to the south and east of the airport is largely urbanized with residential, commercial, and industrial land uses, while land to the north and west of the airport is used for agricultural purposes.

Identify the appropriate CATEX paragraph(s) from Order 1050.1F (paragraph 5-6.1 through 5-6.6) or 5050.4B (Tables 6-1 and 6-2) that apply to the project. Describe if the project differs in any way from the specific language of the CATEX or examples given as described in the Order.

5-6.4. Categorical Exclusions for Facility Siting, Construction, and Maintenance.

e. Federal financial assistance, licensing, or Airport Layout Plan (ALP) approval for the following actions, provided the action would not result in significant erosion or sedimentation, and will not result in a significant noise increase over noise sensitive areas or result in significant impacts on air quality.

- *Construction, repair, reconstruction, resurfacing, extending, strengthening, or widening of a taxiway, apron, loading ramp, or runway safety area (RSA), including an RSA using Engineered Material Arresting System (EMAS); or*
- *Reconstruction, resurfacing, extending, strengthening, or widening of an existing runway.*

This CATEX includes marking, grooving, fillets and jet blast facilities associated with any of the above facilities. (ARP, AST)

The circumstances one must consider when documenting a CATEX are listed below along with each of the impact categories related to the circumstance. Use FAA Environmental Orders 1050.1F, 5050.4B, and the Desk Reference for Airports Actions, as well as other guidance documents to assist you in determining what information needs to be provided about these resource topics to address potential impacts. Keep in mind that both construction and operational impacts must be included. Indicate whether or not there would be any effects under the particular resource topic and, **if needed**, cite available references to support these conclusions. Additional analyses and inventories can be attached or cited as needed.

5-2.b(1) National Historic Preservation Act (NHPA) resources

	YES	**NO**
Are there historic/cultural resources listed (or eligible for listing) on the National Register of Historic Places located in the Area of Potential Effect? If yes, provide a record of the historic and/or cultural resources located therein and check with your local Airports Division/District Office to determine if a Section 106 finding is required. *As shown on Attachment 1, the project area is currently developed with pavement for the existing apron and taxiway. The closest historic resources listed on the National Register of Historic Places (NRHP) are the Henry T. Oxnard Historic District and the Oxnard Public Library, located approximately 1.4 and 1.5 miles east of the Proposed Action, respectively.*	☐	☒

	YES	NO
Does the project have the potential to cause effects? If yes, describe the nature and extent of the effects. *The Proposed Action will not have any direct impacts to historical/cultural resources listed, or eligible for listing, in the NRHP. The improvements associated with the Proposed Action will occur at ground level and will be similar to the existing appearance of the airport in this area. No native soil will be disturbed as part of the taxiway improvements. No impacts to historic and cultural resources will occur in the staging area because of previous disturbance from past airport activities, including being regularly mowed by the airport.*	☐	☒
Is the project area undisturbed? If not, provide information on the prior disturbance (including type and depth of disturbance, if available) *The project area is paved and currently used as aircraft parking apron and taxiway. The staging area has been bladed and graded by past airport activities and is regularly mowed by the airport.*	☐	☒
Will the project impact tribal land or land of interest to tribes? If yes, describe the nature and extent of the effects and provide information on the tribe affected. Consultation with their THPO or a tribal representative along with the SHPO may be required. *The entire project is located on county-owned land within airport property.*	☐	☒

5-2.b(2) Department of Transportation Act Section 4(f) and 6(f) resources

	YES	NO
Are there any properties protected under Section 4(f) (as defined by FAA Order 1050.1F) in or near the project area? This includes publicly owned parks, recreation areas, and wildlife or waterfowl refuges of national, state or local significance or land from a historic site of national, state or local significance. *There are no Section 4(f) resources within or adjacent to the Proposed Action area. South of the Proposed Action area approximately 850 feet (0.15 mile) on the south side of W. 5th Street is Southwest Community Park. Two additional public parks, Seaview Park and Sea Air Park, are located approximately 0.4 mile to the southwest and southeast of the Proposed Action area, respectively.*	☐	☒

	YES	NO
Will project construction or operation physically or constructively "use" any Section 4(f) resource? If yes, describe the nature and extent of the use and/or impacts, and why there are no prudent and feasible alternatives. See 5050.4B Desk Reference Chapter 7. *No direct impacts to Section 4(f) resources will occur as there are no Section 4(f) resources in the Proposed Action area. No constructive use or substantial impairment of Section 4(f) resources will occur since no long-term noise or other operational or visual effects will adversely impact Section 4(f) resources.*	☐	☒
Will the project affect any recreational or park land purchased with Section 6(f) Land and Water Conservation Funds? If so, please explain, if there will be impacts to those properties.	☐	☒

5-2.b(3) Threatened or Endangered Species

	YES	NO
Are there any federal or state listed endangered, threatened, or candidate species or designated critical habitat in or near the project area? This includes species protected by individual statute, such as the Bald Eagle. *The Proposed Action area is fully developed with impervious surfaces and contains no biological resources or habitat for federal or state listed species or designated critical habitat. For purposes of disclosure,* ***Attachment 2*** *contains the U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC) Trust Resources Report.* Source: USFWS IPAC Report (https://ecos.fws.gov/ipac/)	☐	☒
Does the project affect or have the potential to affect, directly or indirectly, any federal or state-listed, threatened, endangered or candidate species, or designated habitat under the Endangered Species Act? If yes, Section 7 consultation between the FAA and the US Fish & Wildlife Service, National Marine Fisheries Service, and/or the appropriate state agency will be necessary. Provide a description of the impacts and how impacts will be avoided, minimized, or mitigated. Provide the Biological Assessment and Biological Opinion, if required.	☐	☒

	YES	NO
Does the project have the potential to take birds protected by the Migratory Bird Treaty Act? Describe steps to avoid, minimize, or mitigate impacts (such as timing windows determined in consultation with the US Fish & Wildlife Service). *There are numerous migratory birds listed by the IPAC database for the general area **(Attachment 2)** of the airport. On the taxiway, the area does not include habitat, including trees or shrubs, to support these species. However in the staging area, which is unpaved, there is the potential presence for ground-nesting birds. The staging area will be disturbed by construction vehicles. A nesting bird survey shall be conducted prior to vegetation-clearing activities if conducted during the migratory bird nesting season, generally March through August. If nests or breeding birds are found, appropriate measures, such as buffers, shall be implemented in keeping with the requirements of the Migratory Bird Treaty Act. If no nests or breeding birds are found, then vegetation removal would proceed as planned.* Source: USFWS IPAC Report (https://ecos.fws.gov/ipac/)	☐	☒

5-2.b (4) Other Resources

Items to consider include:

a. Fish and Wildlife Coordination Act	**YES**	**NO**
Does the project area contain resources protected by the Fish and Wildlife Coordination Act? If yes, describe any impacts and steps taken to avoid, minimize, or mitigate impacts.	☐	☒
b. Wetlands and Other Waters of the U.S.	**YES**	**NO**
Are there any wetlands or other waters of the U.S. in or near the project area? *According to the National Wetlands Inventory (NWI), the closest wetland to the Proposed Action area is an ephemeral drainage channel identified as wetland riverine located west of the aircraft apron and Proposed Action area. This drainage channel connects to a drainage channel which is parallel to S. Victoria Avenue. Please refer to* ***Attachment 3.*** Source: *USFWS National Wetlands Inventory* (http://www.fws.gov/wetlands/Data/Mapper.html)	☒	☐
Has wetland delineation been completed within the proposed project area? If yes, please provide U.S. Army Corps of Engineers (USACE) correspondence and jurisdictional determination. If delineation was not completed, was a field check done to confirm the presence/absence of wetlands or other waters of the U.S.? If no to both, please explain what methods were used to determine the presence/absence of wetlands. *The Proposed Action area is paved.*	☐	☒
If wetlands are present, will the project result in impacts, directly or indirectly (including tree clearing)? Describe any steps taken to avoid, minimize or mitigate the impact. *According to the NWI, there is a man-made drainage channel identified as a wetland riverine west of the Proposed Action area. However, it is ephemeral in nature and acts to allow water to drain from the runway, taxiway, and apron and to divert runoff to the west to a drainage channel adjacent to S. Victoria Ave.* *The man-made drainage channel will not be filled or relocated as a result of the Proposed Action. However, to ensure that sediments from the Proposed Action will not be discharged to the drainage channel, best management practices (BMPs), such as erosion and sediment control, will be implemented.*	☐	☒

Is a USACE Clean Water Act Section 404 permit required? If yes, does the project fall within the parameters of a general permit? If so, which general permit?	☐	☒
c. Floodplains	**YES**	**NO**
Will the project be located in, encroach upon or otherwise impact a floodplain? If yes, describe impacts and any agency coordination or public review completed including coordination with the local floodplain administrator. Attach the FEMA map if applicable and any documentation. *The airport is identified as Other Flood Areas (Zone X) on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FEMA 2010). This zone is defined by FEMA as, "Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood." Therefore, impacts to a floodplain will not occur as a result of the Proposed Action; no increase in impervious surfaces will result from the project. See* ***Attachment 4.*** Source: Federal Emergency Management Agency Flood Service Center (https://msc.fema.gov/portal/search?AddressQuery=Oxnard%20Airport%2C%20Oxna rd%2C%20CA#searchresultsanchor)	☐	☒
d. Coastal Resources	**YES**	**NO**
Will the project occur in or impact a coastal zone as defined by the State's Coastal Zone Management Plan? If yes, discuss the project's consistency with the State's CZMP. Attach the consistency determination if applicable. *The Proposed Action area, as well as the airport itself, is located outside of the California Coastal Zone.* Source: City of Oxnard Zoning Map (01.2017) (https://www.oxnard.org/wp-content/uploads/2017/01/ZoneMap-01.17-AH11x17.pdf)	☐	☒
Will the project occur in or impact the Coastal Barrier Resource System as defined by the US Fish and Wildlife Service?	☐	☒
e. National Marine Sanctuaries	**YES**	**NO**
Is a National Marine Sanctuary located in the project area? If yes, discuss the potential for the project to impact that resource. *The closest National Marine Sanctuary is the Channel Islands National Marine Sanctuary, located approximately 8 miles southwest of the airport.* Source: National Oceanic and Atmospheric Administration National Marine Sanctaries (https://sanctuaries.noaa.gov	☐	☒

f. Wilderness Areas	**YES**	**NO**
Is a Wilderness Area located in the project area? If yes, discuss the potential for the project to impact that resource. *The closest wilderness area to the Proposed Action area is the Sespe Wilderness, located 19 miles north of the airport.*	☐	☒
g. Farmland	**YES**	**NO**
Is there prime, unique, state, or locally important farmland in/near the project area? Describe any significant impacts from the project. *The Proposed Action area consists of land that is paved and maintained for airport use. No farmable land is present.* Source: United States Department of Agriculture Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)	☐	☒
Does the project include the acquisition and conversion of farmland? If farmland will be converted, describe coordination with the US Natural Resources Conservation and attach the completed Form AD-1006.	☐	☒
h. Energy Supply and Natural Resources	**YES**	**NO**
Will the project change energy requirements or use consumable natural resources either during construction or during operations? *During construction, fossil fuels will be used to power construction equipment and vehicles. Water will also be used for washing of construction equipment. Construction of the Proposed Action will not use energy or natural resources beyond what occurs commonly for this type of development. No changes will occur to energy requirements or use of consumable natural resources during airport operations due to the Proposed Action.*	☒	☐
Will the project change aircraft/vehicle traffic patterns that could alter fuel usage either during construction or operations? *The Proposed Action will not change aircraft/vehicle traffic patterns. Following completion of the Proposed Action, fuel usage is expected to remain consistent with existing usage. The Proposed Action will be constructed during a time when the airport runway is already closed.*	☐	☒

i. Wild and Scenic Rivers	YES	NO
Is there a river on the Nationwide Rivers Inventory, a designated river in the National System, or river under State jurisdiction (including study or eligible segments) near the project? *The closest wild or scenic river to the Proposed Action area is a segment of Sespe Creek, located 23 miles northeast; the closest river on the Nationwide Rivers Inventory is the Big Sycamore River, located approximately 12.6 miles southeast.* Sources: National Wild and Scenic Rivers System (https://rivers.gov); Nationwide Rivers Inventory (https://www.nps.gov/subjects/rivers/nationwide-rivers-inventory.htm)	☐	☒
Will the project directly or indirectly affect the river or an area within ¼ mile of its ordinary high water mark?	☐	☒

j. Solid Waste Management	YES	NO
Does the project (either the construction activity or the completed, operational facility) have the potential to generate significant levels of solid waste? If so, discuss how these will be managed. *The Proposed Action calls for the removal of approximately 29,600 cy of AC or base material from the taxiway and apron demolition, which will either be exported off-site for use by the contractor or will be will be hauled to a solid waste facility which accepts construction waste.* *The existing lighting fixtures for the in-kind light replacement portion of the Proposed Action will be disposed of in a local landfill.*	☒	☐

5-2.b(5) Disruption of an Established Community

	YES	NO
Will the project disrupt a community, planned development or be inconsistent with plans or goals of the community? The Proposed Action is within the boundaries of the airport and will not change the overall existing land uses of the airport and/or project site. No changes to off-site land use or planned development within the surrounding community will occur as a result of the proposed project.	☐	☒
Are residents or businesses being relocated as part of the project? *All improvements are located on airport property and the Proposed Action does not include relocation of residents or businesses.*	☐	☒

5-2.b(6) Environmental Justice

	YES	NO
Are there minority and/or low-income populations in/near the project area? *Based on the U.S. Environmental Protection Agency's EJSCREEN online tool, there is an approximate population of 85,600 within two miles of the Proposed Action area. EJSCREEN reports that of the reported population, 81 percent is classified as minority population and 39 percent is classified as low-income. Please refer to* ***Attachment 5.*** *Based on a Google Earth imagery analysis, the closest residential use to the Proposed Action area is 0.25 mile away, south of W. 5th Street.* Sources: U.S. Environmental Protection Agency EJSCREEN (https://ejscreen.epa.gov/mapper/); Google Earth (imagery date August 19, 2019).	☒	☐
Will the project cause any disproportionately high and adverse impacts to minority and/or low-income populations? Attach census data if warranted. *The Proposed Action will be contained entirely on airport property and will not cause any adverse impacts to minority and low-income populations. The residential uses south of W. 5th Street are buffered from the airport by Southwest Community Park. Any impacts will be the same to both minority/low-income and non-minority/higher-income residents, i.e., impacts will not be disproportionately high or adverse.*	☐	☒

5-2.b(7) Surface Transportation

	YES	NO
Will the project cause a significant increase in surface traffic congestion or cause a degradation of level of service provided? *No additional long-term vehicular traffic will be generated from the proposed improvements. Short-term traffic related to construction will be limited to minimal truck and worker trips. No significant traffic congestion will occur on the surrounding street network.*	☐	☒
Will the project require a permanent road relocation or closure? If yes, describe the nature and extent of the relocation or closure and indicate if coordination with the agency responsible for the road and emergency services has occurred.	☐	☒

5-2.b(8) Noise

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Will the project result in an increase in aircraft operations, nighttime operations, or change aircraft fleet mix? *The Proposed Action construction will occur during a 45-day time frame when the airport runway is already closed to air traffic. The proposed improvements will not result in a long-term change of aircraft operations, nighttime operations, or change the aircraft fleet mix at the airport.*	☐	☒
Will the project cause a change in airfield configuration, runway use, or flight patterns either during construction or after the project is implemented? *See previous response.*	☐	☒
Does the forecast exceed 90,000 annual propeller operations, 700 annual jet operations or 10 daily helicopter operations or a combination of the above? If yes, a noise analysis may be required if the project would result in a change in operations. *Although FAA's Terminal Area Forecast, issued January 2020, shows estimated annual operations of 72,239 in 2022, which is when the Proposed Action is anticipated to be implemented, FAA's Traffic Flow Management System Counts (TFMSC) for the last 12 months indicate that the airport experienced 1,120 jet operations.* {ƨdzNŎŜY Federal Aviation Administration Terminal Area Forecast óKŰűLJăʏʞkűI·Ŧ℗ŦI·I·℗∃ƨØkúT C ! ! ¢C a {/ wŜLJƨNű ó₮Nƨ2Y лркнлмф ű2 лпкнлнлú óKŰűLJăʏʞkI·ăLJY℗ŦI·I·℗∃ƨØkűŦY˘ăkăèăkY˘I·λy℗I·ăLJú	☒	☐
Has a noise analysis been conducted, including but not limited to generated noise contours, a specific point analysis, area equivalent method analysis, or other screening method. If yes, provide that documentation. *The Proposed Action would not result in a change in operations.*	☐	☒
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	YES	NO
Is the project located in a Clean Air Act non-attainment or maintenance area? *The airport is located in Ventura County which is designated as a nonattainment area for ozone (serious).* Source: U.S. Environmental Protection Agency *Green Book* (https://www3.epa.gov/airquality/greenbook/anayo_ca.html)	☒	☐
If yes, is it listed as exempt, presumed to conform or will emissions (including construction emissions) from the project be below *de minimis* levels (provide the paragraph citation for the exemption or presumed to conform list below, if applicable) Is the project accounted for in the State Implementation Plan or specifically exempted? Attach documentation. *As outlined in Federal Register, Vol. 72, No. 145, Federal Aviation Administration Federal Presumed to Conform Actions Under General Conformity, non-runway pavement work on taxiways, apron areas, and gate areas ensuring pavement can withstand the weight of aircraft and produce a firm, stable, smooth, year-round, all-weather surface is presumed to conform to the State's Implementation Plan for federal criteria pollutants. Such activity does not increase the capacity of the airport or change the operational environment of the airport.* *The proposed project meets the definition of non-runway pavement work and is presumed to conform as it will match the characteristics, size, and function of the existing taxiway system. The proposed project will not affect runway use, increase capacity, enable new aircraft types, or change existing airfield operations when complete, and the project does not include blasting or substantial ''cut and fill" activity to level the terrain or prepare the surface area.*	☒	☐
Does the project have the potential to increase landside or airside capacity, including an increase of surface vehicles? *The Proposed Action will temporarily involve additional surface vehicle trips during its 45-day construction period. However, this increase in vehicular trips will not cause a significant impact to the level of service for area roadways.*	☐	☒
Could the project impact air quality or violate local, State, Tribal or Federal air quality standards under the Clean Air Act Amendments of 1990 either during construction or operations? *See previous response.*	☐	☒

5-2.b (10) Water Quality

	YES	NO
Are there water resources within or near the project area? These include groundwater, surface water (lakes, rivers, etc.), sole source aquifers, and public water supply. If yes, provide a description of the resource, including the location (distance from project site, etc.). *There are no water resources in proximity to the Proposed Action area, including any impaired waters under the Clean Water Act; the closest sole source aquifer is the Fresno County sole source aquifer, located approximately 155 miles north. The City of Oxnard's public water sources include both local groundwater (Oxnard Plain Basin) and imported water from the Calleguas Municipal Water District, which purchases State Project Water. No groundwater was encountered during the geotechnical investigation for the Proposed Action.* Sources: The National Atlas of the United States (USGS); *City of Oxnard 2030 General Plan Goals and Policies (2011).*	☐	☒
Will the project impact any of the identified water resources either during construction or operations? Describe any steps that will be taken to protect water resources during and after construction. *The airport operates under the State of California's National Pollutant Discharge Elimination System (NPDES) General Industrial Permit, which is regulated by the State of California Water Board - Region 4.* *Approximately 18.5 acres within the Proposed Action area will be disturbed as part of the Proposed Action. Soil disturbance will occur during the excavation of the taxiway and apron demolition, laying of new aggregate base, and the in-kind replacement of taxiway illumination and signage. Due to the amount of soil disturbance, a Construction General Permit will be required.* *The contractor will implement on-site BMPs under the airport's existing storm water pollution prevention plan (SWPPP), including the implementation of project-specific SWPPP, to prevent uncontrolled surface contaminated runoff and capture any discharges during the Proposed Action (FAA AC 150/5370-10H, Item C-102, Standard Specifications for Construction of Airports). The Proposed Action has no potential to cause substantial degradation of surface or groundwater quality during project activities or over the long term once the project is completed.* *Based on water deposits identified during the geotechnical investigation, groundwater could be present under certain conditions. Per recommendations of the geotechnical investigation, underdrains will be installed as part of the engineered design for the project.*	☐	☒
Will the project increase the amount or rate of stormwater runoff either during construction or during operations? Describe any steps that will be taken to ensure it	☐	☒

	YES	NO
will not impact water quality. *The Proposed Action includes reconstruction of existing pavement and will not result in a net increase of impervious surfaces. The amount or rate of stormwater runoff will not change during or following construction.*		
Does the project have the potential to violate federal, state, tribal or local water quality standards established under the Clean Water and Safe Drinking Water Acts? *The airport maintains compliance with the State's General Industrial Permit through implementation of their SWPPP and required stormwater monitoring. The contractor will be required to implement BMPs during all construction activity (FAA Order 1050.1F, Paragraph 5-6.4o and FAA AC 150/5370-10H, Item C-102).*	☐	☒
Are any water quality related permits required? If yes, list the appropriate permits. *Since the Proposed Action will disturb more than one acre of unpaved soil due to the demolition of the runway, a Construction General Permit will be required.*	☒	☐

5-2.b(11) Highly Controversial on Environmental Grounds

	YES	NO
Is the project highly controversial? The term "highly controversial" means a substantial dispute exists as to the size, nature, or effect of a proposed federal action. The effects of an action are considered highly controversial when reasonable disagreement exists over the project's risks of causing environmental harm. Mere opposition to a project is not sufficient to be considered highly controversial on environmental grounds. Opposition on environmental grounds by a federal, state, or local government agency or by a tribe or a substantial number of the persons affected by the action should be considered in determining whether or not reasonable disagreement exists regarding the effects of a proposed action.	☐	☒

5-2.b(12) Inconsistent with Federal, State, Tribal or Local Law

	YES	NO
Will the project be inconsistent with plans, goals, policy, zoning, or local controls that have been adopted for the area in which the airport is located? *The Proposed Action will occur entirely on airport property and will enhance safety at the airport.*	☐	☒

	YES	NO
Is the project incompatible with surrounding land uses? *The Proposed Action will not change the nature of the operations at the airport.*	☐	☒

5-2 .b (13) Light Emissions, Visual Effects, and Hazardous Materials

a. Light Emissions and Visual Effects	**YES**	**NO**
Will the proposed project produce light emission impacts? *The Proposed Action will not change light emissions at the airport even though the Proposed Action includes new taxiway light fixtures once the taxiway is repositioned. The old taxway lights will be removed once the new lighting system is installed, and no increase in lighting intensity will occur.*	☐	☒
Will there be visual or aesthetic impacts as a result of the proposed project and/or have there been concerns expressed about visual/aesthetic impacts? *The Proposed Action will occur at ground level and will be similar to the existing appearance of the airport in this area. No concerns have been expressed regarding the visual or aesthetic changes resulting from the proposed improvements.*	☐	☒
b. Hazardous Materials	**YES**	**NO**
Does the project involve or affect hazardous materials? *Construction of the Proposed Action will involve common hazardous materials, such as fossil fuels for construction equipment and vehicles. All construction activity will be subject to existing permit procedures for the handling, transporting, and disposal of such materials. The contractor will follow standard hazardous materials containment procedures and BMPs should an inadvertent spill occur. If previously unknown contaminants are discovered during construction, or a spill occurs during construction, work shall cease and the National Response Center notified.*	☒	☐
Will construction take place in an area that contains or previously contained hazardous materials? *According to the U.S. Environmental Protection Agency's EJSCREEN website, there are no Superfund sites or brownfields near the airport (please refer to **Attachment 5**).*	☐	☒
If the project involves land acquisition, is there a potential for this land to contain hazardous materials or contaminants? *Not applicable. The project does not involve land acquisition.*	☐	☐

Will the proposed project produce hazardous and/or solid waste either during construction or after? If yes, how will the additional waste be handled? *No hazardous or solid waste will be generated by the Proposed Action in the long term. Solid waste from construction activity will be reused or removed from the site and disposed of properly.*	☐	☒

5-2 .b (14) Public Involvement

	YES	NO
Was there any public notification or involvement? If yes, provide documentation.	☐	☒

5-2 .b (15) Indirect/Secondary/Induced Impacts

	YES	NO
Will the project result in indirect/secondary/induced impacts? *The Proposed Action will enhance safety at the airport and is not anticipated to induce growth or result in changes in land use, population density, or growth rate.*	☐	☒
When considered with other past, present, and reasonably foreseeable future projects, on or off airport property and regardless of funding source, would the proposed project result in a significant cumulative impact? *No on-airport construction has occurred in the past five years or is currently ongoing.* *In the next five years, Ventura County plans to reconstruct Runway 7-25 and connector taxiways A, B, C, D, and E, reconstruct the terminal apron, rehabilitate the central and west hangar areas and ARFF apron, and rehabilitate the perimeter and terminal loop roads. Additionally, a private entity plans to construct a hangar at the airport. These projects will be subject to additional environmental review and any potential impacts associated with the projects would be mitigated during their implementation to reduce impacts. Thus, significant cumulative impacts due to incremental impacts of the Proposed Action in conjunction with other projects will not occur.* *The Proposed Action will be completed in concurrence with the rehabilitation of Runway 7-25 and connector taxiways A, B, C, D, and E, thereby reducing construction traffic and emissions related to overall airport improvements.* *With regards to cumulative climate change, the Proposed Action will not generate new long-term greenhouse gases (GHGs) as no changes to the site's existing use will occur in the foreseeable future.*	☐	☒

Permits

List any permits required for the proposed project that have not been previously discussed. Provide details on the status of permits.

State of California Regional Water Quality Board - Region 4: NPDES Construction General Permit

Environmental Commitments

List all measures and commitments made to avoid, minimize, mitigate, and compensate for impacts on the environment, which are needed for this project to qualify for a CATEX.

The Proposed Action will comply with the provisions of all applicable Ventura County Air Pollution Control District Rules and Regulations, including but not limited to, Rule 50 (Opacity), Rule 51 (Nuisance), and Rule 55 (Fugitive Dust) and Section 7.4.3 of the Ventura County Air Quality Assessment Guidelines (2003) to minimize fugitive dust, particulate matter, and the creation of ozone precursor emissions that may result during construction of the Proposed Action.

A nesting bird survey of the proposed staging area will be conducted prior to vegetation-clearing activities if conducted during the migratory bird nesting season, generally March through August. If nests or breeding birds are found, appropriate measures such as buffers shall be implemented in keeping with the requirements of the Migratory Bird Treaty Act. If no nests or breeding birds are found, then vegetation removal would proceed as planned.

The contractor will follow standard hazardous materials containment procedures and BMPs should an inadvertent spill occur. If previously unknown contaminants are discovered during construction, or a spill occurs during construction, work shall cease and the National Response Center notified.

Based on the recommendations of the geotechnical investigation, underdrains will be installed as part of the engineered design for the project.

California state law requires that if archaeological materials are encountered during construction activities, work in the vicinity of the find shall be halted and a qualified archaeologist shall be consulted to determine the appropriate treatment of the discovery (14 CCR, Chapter 3, Section 15064.5(f)).

The Sponsor will ensure that the project contractor follows BMPs during construction including those identified in FAA AC 150/5370-10G, Item P-156 and measures contained in the airport and project-specific SWPPPs.

Preparer Information

Point of Contact: Michelle Kriks, AICP		
Address: 237 NW Blue Parkway, Ste 100		
City: Lee's Summit	**State:** MO	**Zip Code:** 64063
Phone: (816) 524-3500	**Email Address:** mkriks@coffmanassociates.com	

Signature: _____ Date: _____

Airport Sponsor Information and Certification (may not be delegated to consultant)

Provide contact information for the designated sponsor point of contact and any other individuals requiring notification of the FAA decision.

Point of Contact: Erin Powers, Projects Administrator		
Address: 555 Airport Way, Ste B		
City: Camarillo	**State:** CA	**Zip Code:** 93010
Phone Number: (805) 388-4205	**Email Address**: erin.powers@ventura.org	
Additional Name(s):	**Additional Email Address(es):**	

I certify that the information I have provided above is, to the best of my knowledge, correct. I also recognize and agree that no construction activity, including but not limited to site preparation, demolition, or land disturbance, shall proceed for the above proposed project(s) until FAA issues a final environmental decision for the proposed project(s) and until compliance with all other applicable FAA approval actions (e.g., ALP approval, airspace approval, grant approval) has occurred.

Signature: _____ Date: 7/23/2020

Deputy Director, Airports
County of Ventura.

FAA Decision

Having reviewed the above information, it is the FAA's decision that the proposed project (s) or development warrants environmental processing as indicated below.

Name of Airport, LOC ID, and location:

Oxnard Airport, (OXR)
2889 W. 5th Street
Oxnard, CA 93030

Project Title:

Taxiway F Reconstruction

☐ *No further NEPA review required. Project is categorically excluded per (cite Applicable 1050.1.F CATEX that applies:*

☐ ..An Environmental Assessment (EA) is required.

☐ ..An Environmental Impact Statement (EIS) is required.

☐ ..The following additional documentation is necessary for FAA to perform a complete environmental evaluation of the proposed project.

Name: _____ Title: _____

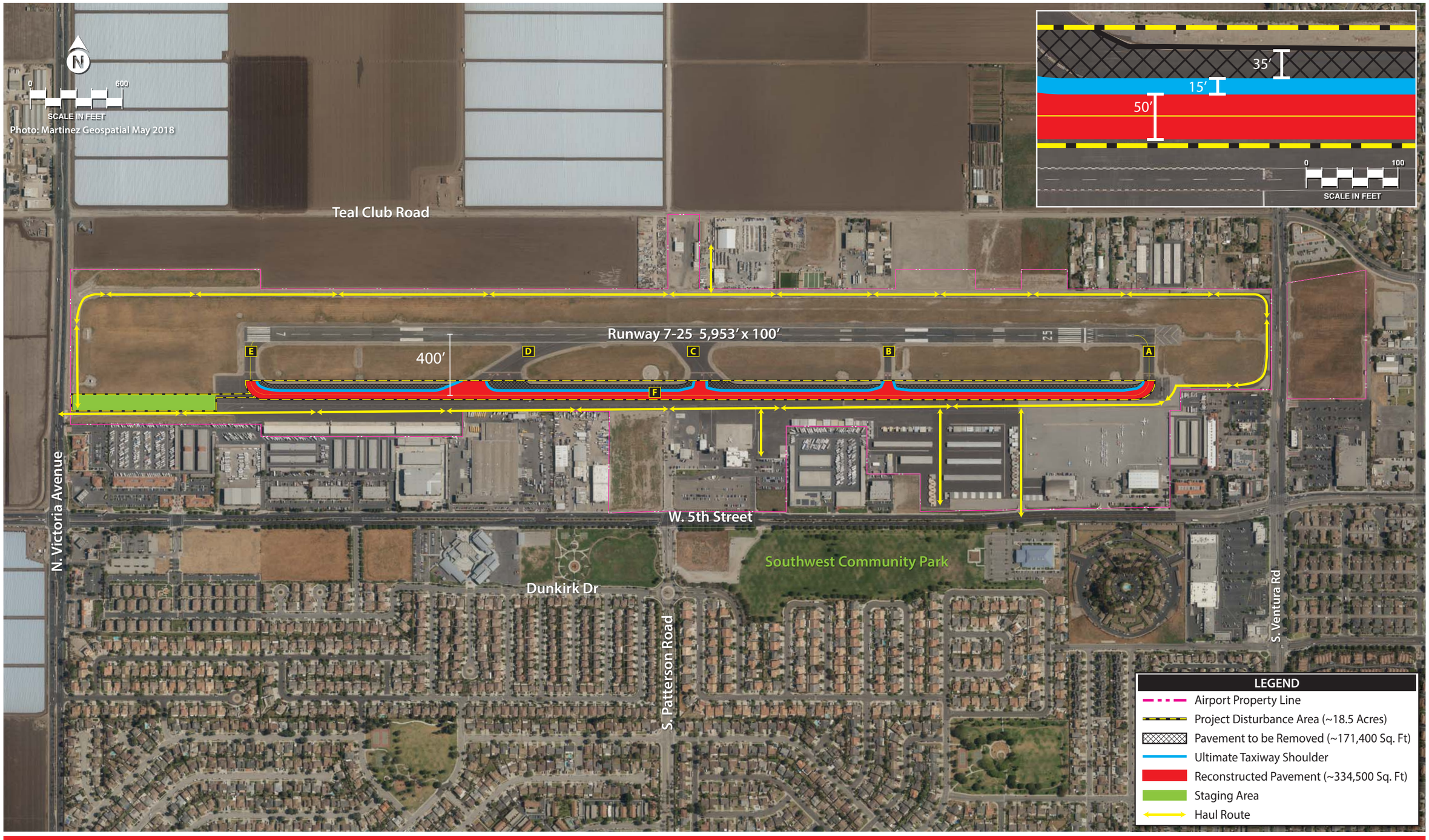
Responsible FAA Official

Signature: _____ Date: _____

Attachment 1

Proposed Project Exhibit

COUNTY OF VENTURA
OXR CMA
DEPARTMENT OF AIRPORTS



Attachment 1
PROPOSED ACTION

Attachment 2

Biological Information

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

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Project information

NAME

Oxnard Airport, Ventura County, CA

LOCATION

Ventura County, California

Local office

Ventura Fish And Wildlife Office

(805) 644-1766
(805) 644-3958

2493 Portola Road, Suite B
Ventura, CA 93003-7726

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS

California Least Tern Sterna antillarum browni — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/8104

Least Bell's Vireo Vireo bellii pusillus — Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/5945

Light-footed Clapper Rail Rallus longirostris levipes — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/6035

Marbled Murrelet Brachyramphus marmoratus — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/4467

Southwestern Willow Flycatcher Empidonax traillii extimus — Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/6749

Western Snowy Plover Charadrius nivosus nivosus — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/8035

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Amphibians

NAME	STATUS

California Red-legged Frog Rana draytonii — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/2891

Fishes

NAME	STATUS

Tidewater Goby Eucyclogobius newberryi — Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/57

Crustaceans

NAME	STATUS

Riverside Fairy Shrimp Streptocephalus woottoni There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8148	Endangered
Vernal Pool Fairy Shrimp Branchinecta lynchi There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/498	Threatened

Flowering Plants

NAME	STATUS
California Orcutt Grass Orcuttia californica No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4923	Endangered
Gambel's Watercress Rorippa gambellii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4201	Endangered
Marsh Sandwort Arenaria paludicola No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2229	Endangered
Salt Marsh Bird's-beak Cordylanthus maritimus ssp. maritimus No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6447	Endangered
Spreading Navarretia Navarretia fossalis There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/1334	Threatened
Ventura Marsh Milk-vetch Astragalus pycnostachyus var. lanosissimus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/1160	Endangered

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Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED,

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WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Allen's Hummingbird Selasphorus sasin This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9637	Breeds Feb 1 to Jul 15
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Aug 31
Black Oystercatcher Haematopus bachmani This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9591	Breeds Apr 15 to Oct 31
Black Skimmer Rynchops niger This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15
Black Turnstone Arenaria melanocephala This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Clark's Grebe Aechmophorus clarkii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jan 1 to Dec 31
Common Yellowthroat Geothlypis trichas sinuosa This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/2084	Breeds May 20 to Jul 31
Long-billed Curlew Numenius americanus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5511	Breeds elsewhere

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Marbled Godwit Limosa fedoa — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9481

Nuttall's Woodpecker Picoides nuttallii — Breeds Apr 1 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9410

Oak Titmouse Baeolophus inornatus — Breeds Mar 15 to Jul 15
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9656

Rufous Hummingbird selasphorus rufus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Short-billed Dowitcher Limnodromus griseus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9480

Song Sparrow Melospiza melodia — Breeds Feb 20 to Sep 5
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Spotted Towhee Pipilo maculatus clementae — Breeds Apr 15 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/4243

Tricolored Blackbird Agelaius tricolor — Breeds Mar 15 to Aug 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3910

Whimbrel Numenius phaeopus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9483

Willet Tringa semipalmata — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

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Wrentit Chamaea fasciata — Breeds Mar 15 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

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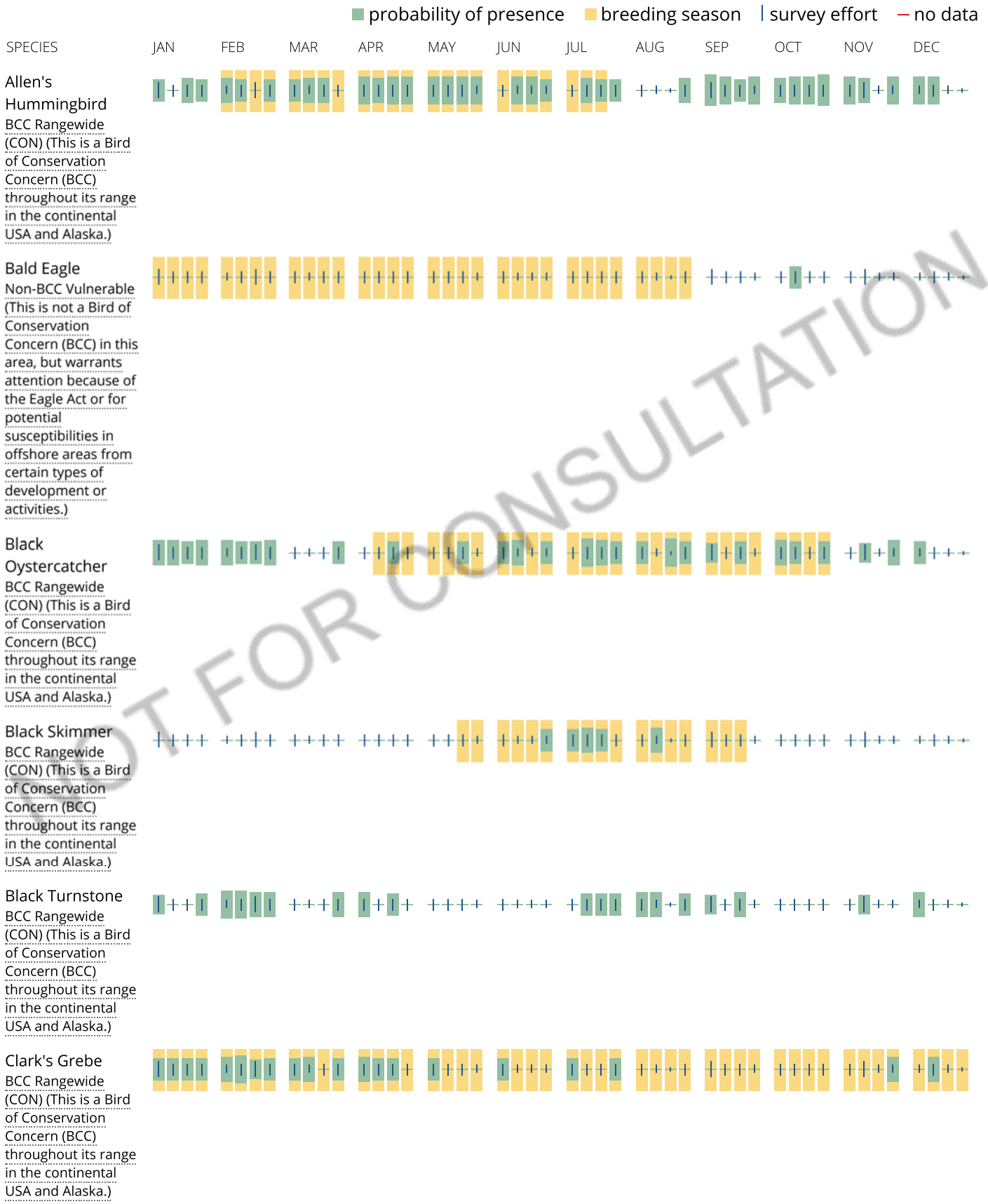
Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



NOT FOR CONSULTATION

Common Yellowthroat
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Long-billed Curlew
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Marbled Godwit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Nuttall's Woodpecker
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Oak Titmouse
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Rufous Hummingbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Short-billed Dowitcher
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

NOT FOR CONSULTATION

Song Sparrow
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Spotted Towhee
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Tricolored Blackbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Whimbrel
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Willet
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Wrentit
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

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Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review.

NOT FOR CONSULTATION

Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

NOT FOR CONSULTATION

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

RIVERINE

R4SBCr
R4SBAr

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

Attachment 3

Water Resources

U.S. Fish and Wildlife Service

National Wetlands Inventory

Oxnard Airport

June 1, 2020

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Attachment 4

Floodplains

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 11. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1994 or later.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

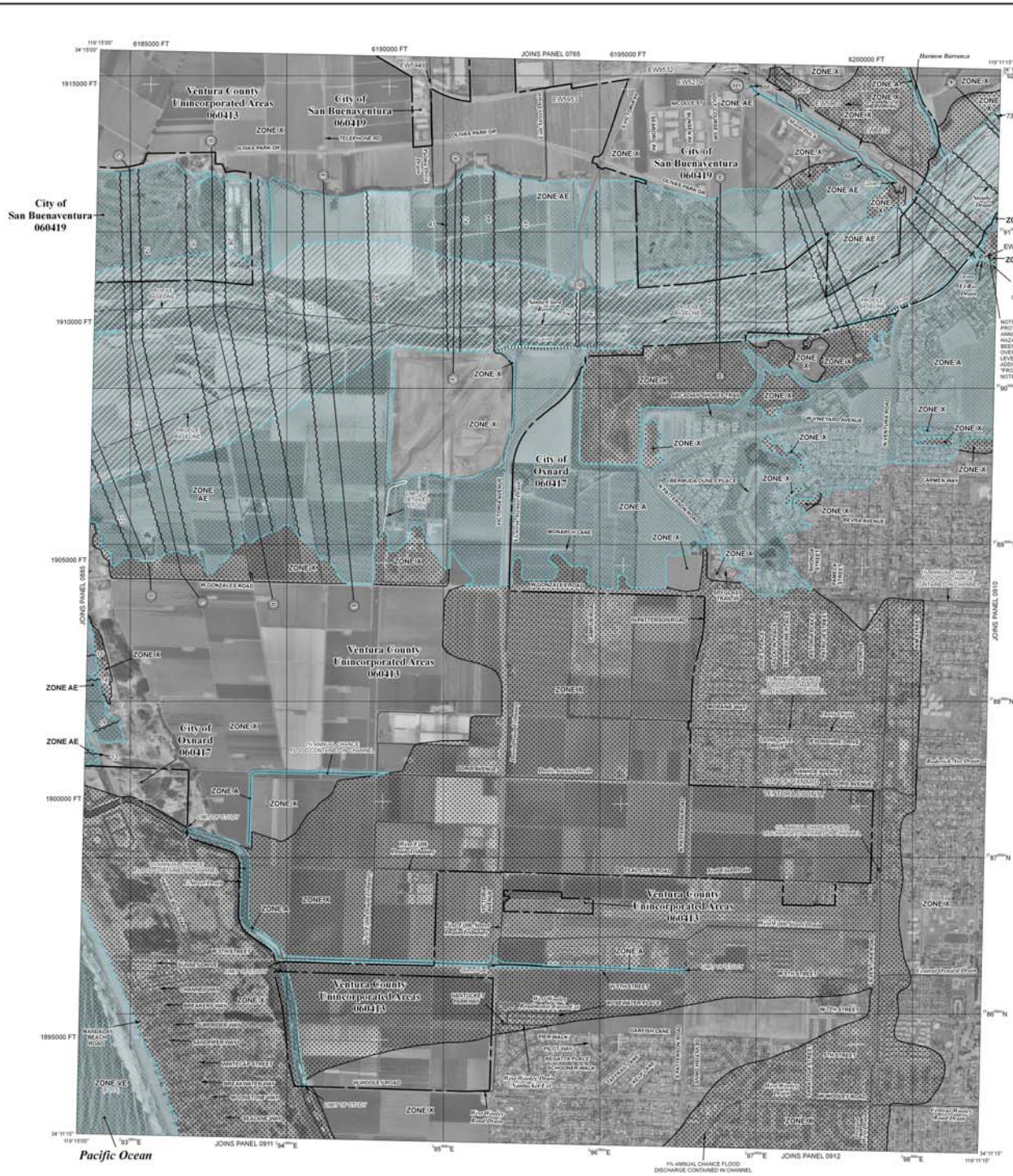
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.

Provisionally Accredited Levee Notes to Users: Check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations by December 1, 2009. If the community or owner does not provide the necessary data and documentation or if the data and documentation provided indicate the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de-accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at http://www.fema.gov/business/nfip/index.shtm.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- Cross section line
- Transect line
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 1000-meter Universal Transverse Mercator grid values, zone 11
- 600000 FT — 5000-foot grid ticks: California State Plane coordinate system, zone V (FIPSZONE 0405), Lambert Conformal Conic projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
January 20, 2010

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

150 0 300 600 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0905E

FIRM

FLOOD INSURANCE RATE MAP

VENTURA COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 905 OF 1275
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
OXNARD, CITY OF	060417	0905	E
SAN BUENAVENTURA, CITY OF	060419	0905	E
VENTURA COUNTY	060413	0905	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06111C0905E

EFFECTIVE DATE
JANUARY 20, 2010

Federal Emergency Management Agency

Attachment 5

United States Census Bureau

American Community Survey Data

(U.S. EPA EJScreen website)

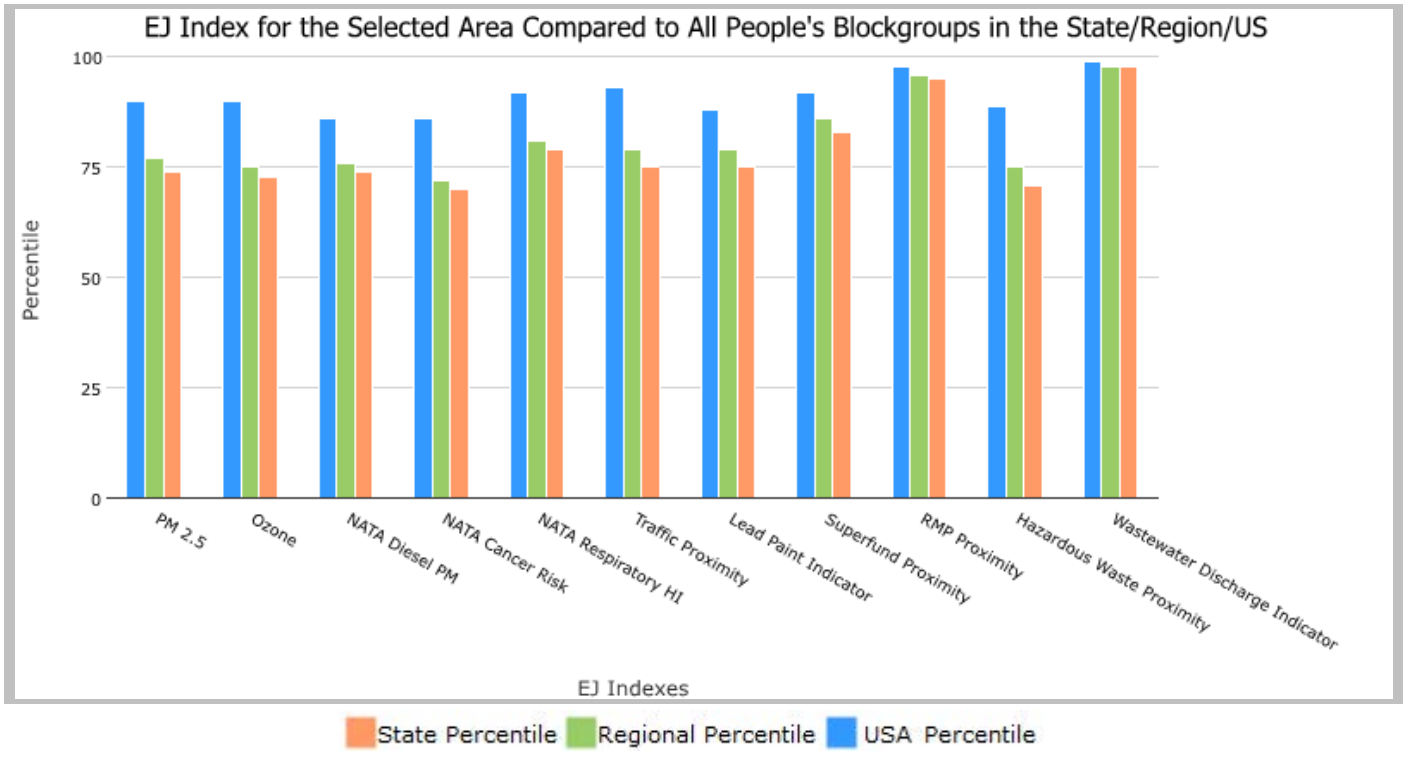
EJSCREEN Report (Version 2019)

2 miles Ring Centered at 34.200219,-119.207161, CALIFORNIA, EPA Region 9

Approximate Population: 85,622

Input Area (sq. miles): 12.56

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	74	77	90
EJ Index for Ozone	73	75	90
EJ Index for NATA* Diesel PM	74	76	86
EJ Index for NATA* Air Toxics Cancer Risk	70	72	86
EJ Index for NATA* Respiratory Hazard Index	79	81	92
EJ Index for Traffic Proximity and Volume	75	79	93
EJ Index for Lead Paint Indicator	75	79	88
EJ Index for Superfund Proximity	83	86	92
EJ Index for RMP Proximity	95	96	98
EJ Index for Hazardous Waste Proximity	71	75	89
EJ Index for Wastewater Discharge Indicator	98	98	99



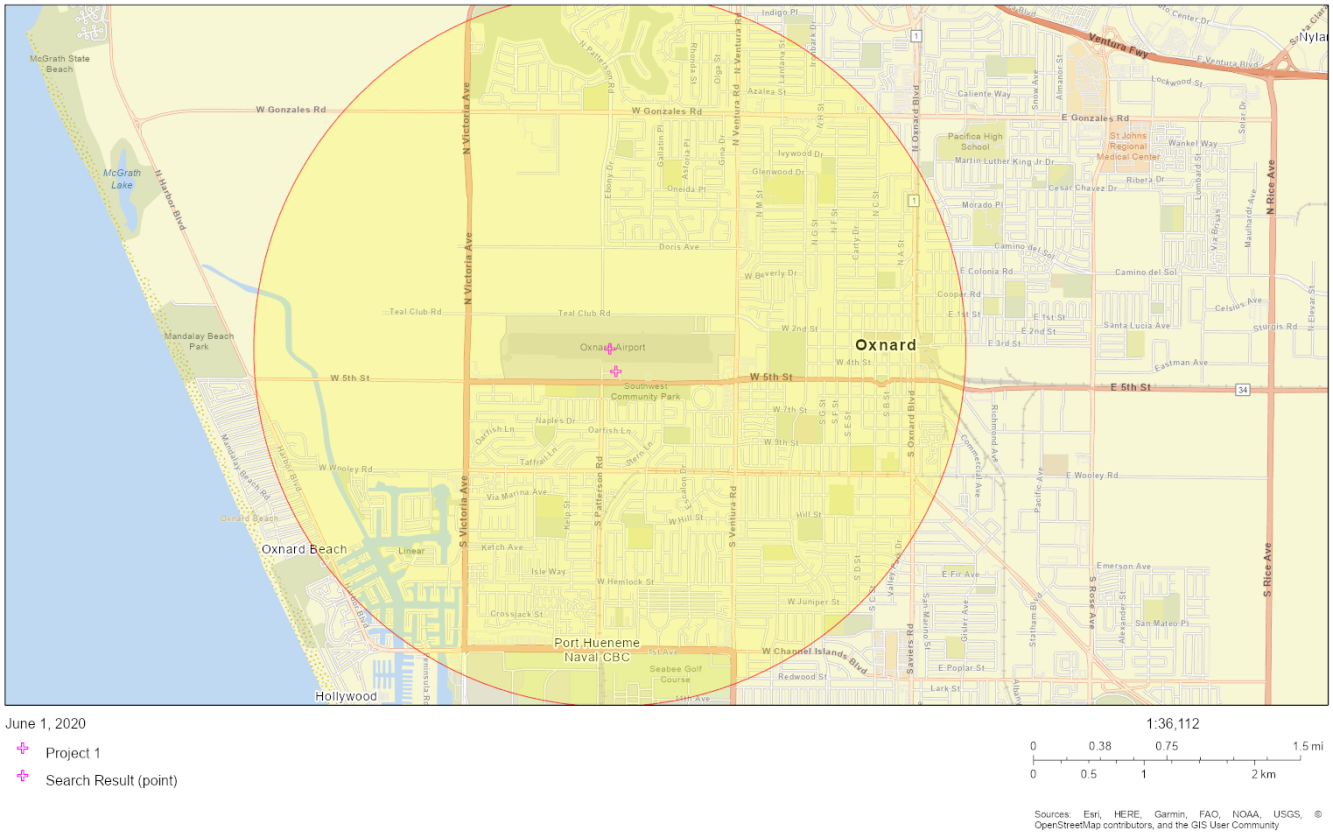
This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

EJSCREEN Report (Version 2019)

2 miles Ring Centered at 34.200219,-119.207161, CALIFORNIA, EPA Region 9

Approximate Population: 85,622

Input Area (sq. miles): 12.56



Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	1

EJSCREEN Report (Version 2019)

2 miles Ring Centered at 34.200219,-119.207161, CALIFORNIA, EPA Region 9

Approximate Population: 85,622

Input Area (sq. miles): 12.56

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Environmental Indicators							
Particulate Matter (PM 2.5 in µg/m^3)	8.92	9.78	38	9.21	50	8.3	69
Ozone (ppb)	41.7	48.2	27	48.9	22	43	37
NATA* Diesel PM (µg/m^3)	0.414	0.468	51	0.479	<50th	0.479	50-60th
NATA* Cancer Risk (lifetime risk per million)	27	36	14	35	<50th	32	<50th
NATA* Respiratory Hazard Index	0.59	0.55	62	0.53	60-70th	0.44	80-90th
Traffic Proximity and Volume (daily traffic count/distance to road)	1100	2000	54	1700	61	750	83
Lead Paint Indicator (% Pre-1960 Housing)	0.2	0.29	49	0.24	57	0.28	52
Superfund Proximity (site count/km distance)	0.15	0.18	74	0.15	78	0.13	79
RMP Proximity (facility count/km distance)	4.2	1.1	95	0.99	96	0.74	98
Hazardous Waste Proximity (facility count/km distance)	1.7	3.4	47	2.9	55	4	74
Wastewater Discharge Indicator (toxicity-weighted concentration/m distance)	100	17	99	31	98	14	99
Demographic Indicators							
Demographic Index	60%	48%	68	47%	70	36%	82
Minority Population	81%	62%	68	59%	70	39%	84
Low Income Population	39%	34%	62	34%	62	33%	64
Linguistically Isolated Population	12%	9%	68	8%	72	4%	86
Population With Less Than High School Education	27%	18%	73	17%	76	13%	87
Population Under 5 years of age	7%	6%	59	6%	59	6%	63
Population over 64 years of age	11%	13%	50	14%	49	15%	39

* The National-Scale Air Toxics Assessment (NATA) is EPA's ongoing, comprehensive evaluation of air toxics in the United States. EPA developed the NATA to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that NATA provides broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. More information on the NATA analysis can be found at: https://www.epa.gov/national-air-toxics-assessment.

For additional information, see: www.epa.gov/environmentaljustice

EJSCREEN is a screening tool for pre-decisional use only. It can help identify areas that may warrant additional consideration, analysis, or outreach. It does not provide a basis for decision-making, but it may help identify potential areas of EJ concern. Users should keep in mind that screening tools are subject to substantial uncertainty in their demographic and environmental data, particularly when looking at small geographic areas. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports. This screening tool does not provide data on every environmental impact and demographic factor that may be relevant to a particular location. EJSCREEN outputs should be supplemented with additional information and local knowledge before taking any action to address potential EJ concerns.

Attachment 4

FAA-C-1391e

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FAA-C-1391e
May 2019
SUPERSEDING
FAA-C-1391d
September 2014

DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION SPECIFICATION

INSTALLATION, TERMINATION, SPLICING, AND TRANSIENT/SURGE PROTECTION OF UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEM POWER CABLES

This specification is approved for use by all Departments of the Federal Aviation Administration (FAA)

FOREWORD

1. This specification provides requirements for the installation of FAA-owned and maintained underground electrical line distribution (ELD) systems in support of FAA facilities.

2. ELD systems include power cable and associated components on the exterior, commercial power supply side of the circuit at the airfield or remote site through to the service entrance power panels of FAA facilities. These are medium-voltage (MV) and low-voltage (LV) underground power cables, and overhead lines. Low-voltage systems such as MALSRs and ODALs, and high-voltage systems such as ALSF-2s are also included.

3. This specification excludes facility service entrance (load side) wiring (except for ALSF, MALSR, and RWSL system cables); communication, control, and signal cables. For guidance pertaining to these types of cables, consult the appropriate office of primary responsibility for applicable standards.

4. For installation of communication, control, and signal cables, including fiber optic transmission systems (FOTS), refer to FAA-STD-061, *Airport Fiber Optic Transmission Systems*; FAA-E-2042, *Cable, Electrical Control, Exterior*; and FAA-E-2072, *Electrical Cable, Telephone Exterior*.

5. Power for airfield lighting cables has a separate set of standards and procedures. Refer to the appropriate FAA Advisory Circulars (AC) 150/5340-7 and -26, and associated governing standards.

6. This is an update to an existing specification. It assimilates recent utility industry knowledge concerning ELD systems, with the aim of providing safer, more reliable FAA underground MV and LV ELD systems.

7. Changes in this version of the document include (see change history, page iv):
   a. Revised from “d” version to “e” version,
   b. Miscellaneous updates collected from field comments,
   c. Addition of certain lighted navaids system cables.

8. This specification ensures that minimum FAA requirements are met based on current commercial practices relating to safety, reliability, and restorability of FAA electrical line distribution systems. Contractors are encouraged to provide innovative, best-value solutions wherever possible within the bounds of these requirements.

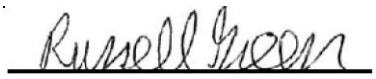
Comments, suggestions, or questions on this document should be addressed to: Federal Aviation Administration, AJW-22, Power Services Group, Power Cable Program, 800 Independence Ave., S.W., Washington, DC 20591, https://employees.faa.gov/org/linebusiness/ato/operations/technical_operations/atc_facilities/power_services/power_cable/

Approved by:

5/22/19

Peter Megna
Manager (A),
Power Services Group, AJW-22

Date



5/22/19

Russell Green,
Manager,
Power Systems Engineering Team,
AJW-221

Date

4/21/19

Michael Vellucci,
Power Cable Program Manager,
Power Systems Engineering Team,
AJW-221

Date

Change History

1. Originator Name and Address AJW-22, Power Services Group	2. [ ] Proposed	3. Code Identification	4. Document No. FAA-C-1391c
Washington, DC	[X] Approved	5. Code Identification	6. DCN No.
7. System Designation	8. Related ECR/NCP No. ATO0W-CABLE-1023	9. Contract No.	10. Contractual Activity N/A
11. Product Integration Plan		12. Effectivity	

This notice informs recipients that the standard identified by the number (and revision letter) shown in block 4 has been changed. The pages changed by this DCN (being those furnished herewith) carry the same date as the DCN. The page numbers and dates listed below in the summary of changed pages, combined with non-listed pages of the original issue of the revision shown in block 4, constitute the current version of this specification.

13. DCN No.	14. Pages changed	S*	A/D*	15. Date
	Summary - general: a. Deletion of requirements for non-electrical-line-distribution (non-ELD) systems, including communications and telecommunications cables (both copper and FOTS), control cables, and constant-current-regulated runway approach and edge lighting power cables. b. Emphasis on product changes in FAA ELD systems from the older 2.4 kV to 4.16 kV distribution circuits to the newer industry standard medium voltage systems, e.g., 3-phase/7200 V (phase to neutral). The Power Cable Program favors 15 kV rated cables and equipment to bring FAA ELD systems up to compatibility with the utility industry and to meet future FAA needs. c. Increased attention to the protection of sensitive internal constituent parts of MV cable systems during installation, by (1) the imposition of stringent tests meeting IEEE criteria, and (2) using proper cable pulling, splicing, and terminating techniques. d. Addition of power cable acceptance testing process for newly installed cables (text main body and Appendix C). Acceptance tests classified as destructive by the IEEE, such as the DC high potential (HIPOT) test, shall no longer be performed on in-service power cables. e. Treatment of the qualifications of MV "qualified persons" during installations.			1/24/2012
	Details – changes: a. Non ELD systems, deletions from FAA-C-1391b version: pp. 1-4, 7-15, 17-19. Sections/paragraphs affected: 2.1.2, 2.1.3, 3.1.2, 3.2.1, 3.2.2, 3.4, 3.4.1.1, 3.4.1.2, 3.4.2.2, Table I, 3.4.3, 3.4.3.1, 3.4.4, 3.4.5, 3.5.1, 3.5.2, 3.6, 4.2, 4.3, 4.5, 4.5.1, 4.5.2, 4.6, 4.6.1, 4.6.2, 4.6.3, App A.			1/24/2012
	Details – changes: b. Product changes, additions in FAA-C-1391c: cable 3.3.6.2; 15 kV surge protection 5.8.2; 15 kV splice kits 5.9.			1/24/2012
	Details – changes: c. Installation of cables, additions in FAA-C-1391c: splice procedures 5.9; cable pulling 5.5.12 and App B; cable end sealing 5.5.11; installer qualifications 3.3.3.2; 50/60 Hz offline partial discharge test 3.3.6.3, 3.3.6.4.			1/24/2012
	Details – changes: d. Acceptance testing procedures, additions in FAA-C-1391c: 3.3.6; Appendix C.			1/24/2012
	Details – changes: e. Qualified persons and contractors, change in FAA-C-1391c: 3.3.3 (all), 3.3.6.4, 5.9.			1/24/2012
	Updated document from "c" version to "d" version.			4/4/2014
	Miscellaneous updates collected from field comments.			4/4/2014
	Submittals updated, products updated (added power cable, transformers, switchgear, service disconnects, terminations/splices, overcurrent devices, underground duct systems, and ducts and fittings).			4/4/2014
	Manhole cover wheel loading and guard wire grounding upgraded.			8/15/2014
	Miscellaneous updates as a result of field comments.			5/1/2019
	Expanded the scope of ELD systems to include low-voltage systems cables such as for MALSR and ODALS, and high-voltage systems such as ALSF-2s. Added Section 6 to provide specific installation instructions for these systems. Added Appendix G.			5/1/2019
	Submittals section updated; submittals matrix added as an appendix.			5/1/2019
	Added duct joining processes, see also appendix for bonding adhesives data sheet.			5/1/2019
	Product section updated. Installation processes updated.			5/1/2019

CONTENTS

1. SCOPE

This specification defines the minimum requirements for the installation of FAA's low voltage (typically 600 V and below) and medium voltage electrical line distribution (ELD) power cables buried directly in the earth or installed in underground duct or conduit. The industry defines medium voltage as between 1,000 V and 34,500 V nominal voltage line to ground and low voltage as 1000 V and below.

The installation work includes surveying, trenching, and backfilling, installation of cables, conduits, concrete-encased ducts, manholes, hand holes, duct markers, joints and splicing, terminating, providing surge protection, and testing of cables for acceptability of the finished ELD. In addition, this specification defines the responsibilities of the contractor with respect to safety, quality assurance, and quality control during the installation and testing of ELD systems.

This specification covers installation and acceptance testing of FAA ELD systems only. For maintenance of these systems, refer to FAA Order 6950.22.

This specification applies to installation of medium and low voltage facility electrical supply power cables and associated equipment. These systems provide facility power from the power supplier's primary service to the service entrance power panels of FAA facilities, to include low-voltage systems cables that feed MALSRs and ODALs, and high-voltage systems supplying power to ALSF-2 equipment.

For detailed information on the installation of non-ELD cable systems such as control cables, fiber optics telecommunication (FOTS) cables, communication cables, etc., consult with the office of primary responsibility (OPR). Consult also the applicable airport circulars for guidance. For basic separation requirements of FAA utility power cable systems from non-electrical-power cable systems, consult the section of this specification entitled, "Separation of Cables" (5.5.10).

When physically integrating non-ELD cables with power cables, do not assume all of the provisions of FAA-C-1391 apply without first coordinating with the appropriate OPR and the FAA onsite project engineer responsible for integration of the various types.

For detailed installation requirements for low-voltage systems such as MALSRs and ODALs, and high-voltage systems such as ALSF-2, see Section 6 and Appendix G.

Non-ELD OPRs consist of:

a. Control Cables – Telecommunications Services Group, AJM-313,
b. Fiber Optics Transmission Systems (FOTS) – Air-Ground Data Communications Group, AJM-313,
c. Voice Communications – Air-Ground Data Communications Group, AJM-313,
d. Runway Status Lights (RWSL) – Lighting Systems Group, AJW-46,
e. Others (as applicable).

For outdoor electrical work, this document takes precedence over FAA-C-1217, *Electrical Work, Premises Wiring*. FAA-C-1217 is not to be used for outdoor ELD electrical requirements. However, for the portions of the ELD that emerge from the ground and pass into an enclosed space such as a service disconnect rack, FAA-C-1217 shall apply.

2. APPLICABLE DOCUMENTS

2.1 General

Due to the continuous updating of Government documents, the FAA Contracting Officer and/or the FAA Project Engineer must specify the document version and publication date current at the time of contract award or project design. The documents below form a part of this specification. Some of the FAA documents listed are out of date but are still applicable; reference the notations next to each reference provided. FAA tailoring organizations should consult with the offices of primary responsibility to obtain the most recent applicable documentation.

2.2 Order of precedence

Requirements of ELD installations are based on the National Electrical Code (NEC); FAA-STD-019, *Lightning and Surge Protection, Grounding, Bonding, and Shielding Requirements for Facilities and Electronic Equipment*; and the content outlined in this document.

In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.3 Government documents

The following citations are government documents that are used as references in this specification.

2.3.1 FAA orders, standards, specifications, and handbooks

The most recent versions of the following FAA orders, standards, specifications, and handbooks are incorporated by reference as a part of this document. Unless otherwise stated, requirements contained in these documents are as cited in the project solicitation or contract. (Copies of FAA orders, standards, specifications, handbooks, drawings, and other applicable FAA documents may be obtained from the Contracting Officer issuing the invitation-for-bids or request-for-proposals. Requests should fully identify the material desired; for example: specification, standard, amendment, identification numbers of drawings possessing standard FAA signature block, and dates. Requests should cite the invitation for bids, request for proposals, the contract involved, or other source of the requested material.)

2.3.1.1. ORDERS

3900.19	FAA Occupational Safety and Health Program
JO 3900.57A Change 1	EOSH Requirements in the Planning and Execution of Construction and Maintenance Activities at NAS Facilities.
JO 3900.64	Air Traffic Organization Electrical Safety Program

JO 6750.16	Siting Criteria for Instrument Landing Systems
JO 6950.27	Power System Analyses: Load Flow Calculations, Short Circuit Analysis, Protective Device Coordination Studies, and Arc Flash Risk Assessment

2.3.1.2 FAA STANDARDS

FAA-STD-XXX	Underground Electric Line Distribution (ELD) Systems [Future]
FAA-STD-019	Lightning and Surge Protection, Grounding, Bonding, and Shielding Requirements for Facilities and Electronic Equipment
FAA-STD-061	Airport Fiber Optic Transmission Systems (FOTS)

2.3.1.3 ADVISORY CIRCULARS AND SPECIFICATIONS

150/5300-13	Airport Design
150/5320	Surface Drainage Design
150/5370	FAA Standards for Specifying Construction of Airports
150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
FAA-E-113	Poles, Wood, Treated
FAA-C-1217	Electrical Work, Premises Wiring
FAA-E-2793	Cable, Electrical Power, 2,000 to 35,000 Volts
FAA-E-2042	Cable, Electrical Control, Exterior
FAA-E-2072	Cable, Telephone Exterior
FAA-E-2171	Cable, Coaxial Armored, M17/6-RG-11
FAA-E-2271	Cable, Coaxial, 50-Ohn, Foam Dielectric, 1/2 and 7/8 Inch
FAA-E-2524	Cable, Radio Frequency, Foam Dielectric, 1/2 and 7/8 Inch, Corrugated Type
FAA-E-2619	Cable, Coaxial, RG-35/U, Armored

FAA-E-2761 Cable, Fiber Optic, Multimode and Single Mode, Multifiber

2.3.1.4 HANDBOOKS

FAA-HDBK-XXX Underground Electric Line Distribution (ELD) Systems [Future]

2.3.2 Other Government documents, drawings, and publications

The following Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

American Association of State Highway & Transportation Officials Specifications

AASHTO HB-17 Standard Specifications for Highway Bridges

AASHTO HS-20 Standard Specifications for Highway Bridges

Occupational Safety and Health Administration Codes

Part 1926 Safety and Health Regulations for Construction

29 CFR 1910 Occupational Safety and Health Standards (General Industry)

Military Specifications

MIL-C-38359 Cable, Power, Electrical, Airport Lighting, Cross-Linked, Polyethylene XLP

MIL-I-3825 Insulating Tape, Self-Fusing

DLA A-A-50563 Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical: Cast Metal

DLA A-A-59213 Splice Connectors

DLA A-A-59214 Junction Box: Extension, Junction Box; Cover, Junction Box (Steel, Coated with Corrosion-Resistant Finish)

DLA A-A-59544 Cable and Wire, Electrical (Power, Fixed Installation)

DLA A-A-59551 Wire, Electrical, Copper (Uninsulated)

Navy A-A-59827	Topside Conduit (Flexible) and Conduit fittings, Electrical: Composite Based (Non-metallic)
UFC 3-350-03FA	Electrical Power Supply and Distribution
UFC 3-600-01	Fire Protection Engineering for Facilities
UFGS 26 12 19.20	Single-Phase Transformers
UFGS 26 12 19.10	Three-Phase Transformers
UFGS 33 70 02.00 10	Electrical Distribution System, Underground

Federal Specifications

W-C-375/3	Circuit Breakers, Molded Case; Branch Circuit and Service
W-S-865	Switch, Box (Enclosed), Surface Mounted
WW-C-566	Conduit, Metal, Flexible
WW-C-581	Class 1 Type A with Standard for Electrical Rigid Metal Conduit - Steel, UL 6

2.4 Non-Government publications

The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

American National Standards Institute (ANSI) Standards

ANSI 6	Standard for Rigid Metal Conduit. (Same as UL 6)
ANSI 467	Standard for Grounding and Bonding Equipment. (Same as UL 467)
ANSI 514	Fittings for Cable and Conduit. (Same as UL 514)
ANSI 651	Schedule 40 and 80 Rigid PVC Conduit. (Same as UL 651)
ANSI A14.3	Safety Code for Fixed Ladders
ANSI C2	National Electrical Safety Code (NESC). (Same as IEEE C2)
ANSI C62.11	IEEE Standard for Metal-Oxide Surge Arresters for AC Power Circuits (>1 kV). (Same as IEEE C62.11)

ANSI C62.22	IEEE Guide for the Application of Metal Oxide Surge Arrester for Alternating Current Power Circuits. (Same as IEEE C62.22)
ANSI C62.22.1	Guide for the Connection of Surge Arresters to Protect Insulated, Shielded Electric Power Cable Systems (Same as IEEE 1299/C62.22.1)
ANSI C62.41	Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits. (Same as IEEE C62.41)
ANSI C80	Rigid Steel Conduit – Zinc Coated. (Same as NEMA C80)
ANSI C119.1	Sealed Insulated Underground Connector System Rated 600 Volts. (Same as NEMA C119.1)
ANSI FB 1	Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies. (Same as NEMA FB1)
ANSI RN 1	Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Steel Conduit. (Same as NEMA RN 1)
ANSI S-97-682-2007	Standard for Utility Shielded Power Cables Rated 5 through 46 kV (Same as ICEA S-97-682-2007)
ANSI TC 6 & 8	PVC Plastic Utilities Duct for Underground Installation. (Same as NEMA TC 6 & 8)
ANSI Z535	Safety Alerting Standards. (Same as NEMA Z535)

American Society of Civil Engineers Standards

CI/ASCE 38-02	Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data.

American Society for Testing & Materials (ASTM) Standards

ASTM A48	Standard Specification for Gray Iron Castings.
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors
ASTM C267-97	Standard Test Methods for Chemical Resistance of Mortars, Grouts, Monolithic Surfacings and Polymer Concretes

ASTM C478	Standard specification for Precast Concrete Manhole Section (AASHTO No. M199)
ASTM C579-96	Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings and Polymer Concretes
ASTM C580-93	Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings and Polymer Concretes
ASTM C858	Standard Specification for Underground Precast Concrete Utility Structures
ASTM C990	Standard Specification for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D1056	Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D2444-93	Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
ASTM F512	Standard Specification for Smooth-wall PVC Conduit and Fittings for Underground Installation
ASTM 1962	Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit under Obstacles
ASTM F2160	Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit

Institute of Electrical and Electronics Engineers (IEEE) Standards

IEEE C2	National Electrical Safety Code (NESC)
IEEE-48	Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV

IEEE 80	IEEE Guide for Safety in AC Substation Grounding
IEEE-100	The Authoritative Dictionary of IEEE Standards Terms
IEEE-386	Standard for Separable Insulated Connector Systems for Power Distribution Systems above 600 V
IEEE-400.2	IEEE Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF)
IEEE-400.3	Guide for Partial Discharge Testing of Shielded Power Cables in a Field Environment
IEEE-404	Standard for Power Cable Joints
IEEE-525	Cable Systems in Substations
IEEE-835	Power Cable Ampacity Tables
IEEE C62.11	IEEE Standard for Metal-Oxide Surge Arresters for AC Power Circuits (>1 kV).
IEEE C62.22	IEEE Guide for the Application of Metal Oxide Surge Arrester for Alternating Current Power Circuits
IEEE 1299/C62.22.1	Guide for the Connection of Surge Arresters to Protect Insulated, Shielded Electric Power Cable Systems
IEEE C62.41 (Formerly IEEE 587)	Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits

Insulated Cable Engineers Association (IECA) Standards

ICEA S-94-964	Concentric Neutral Cables Rated 5-46 kV
ICEA S-97-682-2007	Standard for Utility Shielded Power Cables Rated 5 through 46 kV

International Electrotechnical Commission (IEC) Standards

IEC 60071-2	Insulation coordination Part 2: application guide.

National Electric Manufacturers Association (NEMA) Standards

RN 1	Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Steel Conduit
FB1	Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
TC 2	Electrical Polyvinyl Chloride (PVC) Tubing (EPT) and Conduit (EPC-40 AND EPC-80)
TC 3	PVC Fittings for Use with Rigid PVC Conduit and Tubing
TC 6 & 8	PVC Plastic Utilities Duct for Underground Installation
TC 7	Smooth-Wall Coilable Electrical Polyethylene Conduit
TC 9	Fittings for PVC Plastic Utilities Duct for Underground Installation
TC 14	Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings
NECA/NEMA 605	Recommended Practice for Installing Underground Nonmetallic Utility Duct

Underwriters' Laboratories (UL) Inc. Standards

UL 6	Standard for Rigid Metal Conduit
UL 467	Standard for Grounding and Bonding Equipment
UL 514	Fittings for Cable and Conduit
UL 651	Schedule 40 and 80 Rigid PVC Conduit

National Fire Protection Association (NFPA) Standards

NFPA-70	National Electric Code (NEC)
NFPA-70E	Electrical Safety in the Workplace
NFPA-780	Standard for the Installation of Lightning Protection Systems
NEC Hdbk	Article 110.16, Flash Protection

NEC Hdbk	Article 344.10, Rigid Metal Conduit: Type RMC
NEC Hdbk	Article 280, Surge Arrestors, Over 1 kV

3. GENERAL

3.1 Definitions

Unless otherwise specified, electrical and electronics terms used in this specification, and on the drawings, shall be as defined in IEEE 100, *The Authoritative Dictionary of IEEE Standards Terms*.

In the text of this specification, the term “conduit” refers to a single pipe through which cable passes. The term “duct” refers to one or more conduits connected through a manhole or hand hole system.

In the text of this specification, "medium voltage cable splices" and "medium voltage cable joints" are used interchangeably and have the same meaning.

For the purposes of this specification, “FAA electrical line distribution systems (ELD)” are defined as:

Electrical Line Distribution (System). An FAA owned and operated electrical power distribution system (underground or overhead) running from a power source to FAA facility load(s). Low-voltage systems such as MASLRs and ODALs, and high-voltage systems such as ALSF-2s are also included in ELD systems. An ELD may include some or all of the following: power cable; transformers; sectionalizing switchgear; switchpads; disconnect switches; manholes; hand-holes; utility poles; direct earth buried (DEB) cables; and underground duct banks. Runway edge lighting cables, fiber optic communication cables, and control and signal cables are not included as part of ELD.

The demarcation point between an FAA ELD system and FAA facility premises wiring on an airport can be ambiguous. When in doubt, consult AJW-22, Power Services Group, Power Cable Program.

3.2 Submittals

Submittals are required for quality control (see Appendix E), unless otherwise directed. Submittals marked A are required. For submittals marked B or C, the FAA task or contract specifier shall evaluate the contract for each kind, voltage, or type of submittal used on the project and make a determination as to whether the submittal is required. Examples given are not limited to those shown in parentheses:

“A” indicates that the submittal is required.

“B” indicates that the submittal is required, unless specifically deleted by the contract specifier.

“C” indicates that a submittal is not generally required because it is expensive and/or time consuming (i.e., a special case). If the submittal is required, the contract specifier shall check off

the required submittal on the submittals matrix (Appendix E) and in the contract documents (as a CLIN item).

a. Contractor-generated design data (ANSI C2 and FAA-STD-032, Para 3.1.13)
    1. Code analysis (e.g., load flow study, voltage drop calculations, short circuit analysis, clearance calculations, design arc flash study, etc) (ANSI C2) [A]
    2. Design assumptions and parameters (FAA-STD-032) [B]
    3. Test reports and findings (e.g., soil resistivity) [C]
    4. Design calculations (FAA-STD-032) [A]
    5. Contractor-generated design drawings or sketches. [A]
b. Cost estimates [A]
c. Medium voltage cable [A]
d. Medium voltage cable splices and joints* [A]
e. Medium voltage cable terminations* [A]
f. Conduits [A]
g. Duct construction materials (e.g., concrete, alternatives to concrete where approved, fills and layers, etc) [A]
h. Switch pads and sectionalizing switchgear [A]
i. Transfer switches (automatic and manual) [A]
j. Transformers [A]
k. Surge arresters [A]
l. Live end caps or protective caps [A]
m. Precast concrete structures [A]
n. Sealing Material [B]
o. Manhole frames and covers [A]
p. Hand hole frames and covers [A]
q. Cable supports (racks, arms and insulators) [A]
r. Protective devices and coordination study [A]
s. As-built arc flash hazard study. Required when an existing study is not available, or if modifications are being made to the existing ELD system. [A]
t. Power cable manufacturer's factory certification [A]
    Medium voltage cable factory certification as per FAA-E-2793, Section 4.2 (includes meeting ICEA S-94-649, Sections 4.3.2.1 and 9.13). [A]
u. Field acceptance checks and tests (see Appendix C), including demonstrating the adequate performance of the circuit breakers. [A]
v. Arc-proofing test for cable fireproofing tape [C]
w. Cable installation plan and procedure (use cable installation plan only when pulling cable between manholes; do not use for pulling from pole riser to manhole only):
    1. Site layout drawing with cable pulls numerically identified [C]
    2. The manufacturer, type, and quantity of lubricant used on pull [C]
    3. The cable manufacturer and type of cable [A]
    4. The dates of cable pulls, time of day, and ambient temperature [C]
    5. The length of cable pull, calculated maximum cable pulling tension, and calculated maximum sidewall pressure. For cable pulls, a single generic table of cable pulls may be submitted. [A]
    6. The actual cable pulling tensions encountered during pull [C]

7. Certificates (tensiometer/dynamometer calibration, VLF tester calibration, etc) [C]

x. Cable splicer/terminator qualifications* The PMO shall assist with the designation of "qualified."[A]
y. Cable installer qualifications* The PMO shall assist with the designation of "qualified." [A]
z. Project design drawings [A]

*Note: The contractor shall provide the product drawings showing details of the connecting methods to be used, and a statement of the experience of the contractor in making connections on underground systems with the proposed product. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable. Products shall meet the latest editions of applicable standards as follows:

APPLICATION STANDARD (USE LATEST ISSUED)	LEVEL OF ACCEPTANCE
IEEE-404 Standard for Power Cable Joints	Meet or Exceed
IEEE-48 Standard for Cable Terminations	Meet or Exceed
ANSI C119.1 Sealed Insulated Underground Connector System Rated 600 Volts	Meet or Exceed
IEEE – 386 Standard for Separable Insulated Connectors	Meet or Exceed

3.3 Quality assurance

All work shall comply with the National Electrical Code (NEC) and IEEE C2/National Electrical Safety Code (NESC) for components and installation. To the maximum extent practicable, furnish products that are listed and labeled by a nationally recognized testing laboratory (NRTL) for the application, installation condition, and the environment in which the products are installed. Use of nonlisted components will not be allowed unless (1) it is demonstrated that listed components are not available, and (2) the FAA preapproves such components before installation. Approval shall be at the discretion of the FAA.

3.3.1 Quality control

The quality of civil engineering work, such as trenching, ducting, and other operations, shall be inspected by the FAA and approved after each major construction step. The FAA Project Engineer shall identify which equipment and material shall require factory acceptance tests before cost estimating the project. The contractor shall inform the FAA of manufacturing/shipping schedules and shall offer representatives of the FAA the opportunity to witness acceptance tests. These tests shall be performed on a statistically meaningful number of samples, as specified by FAA engineers. After receipt of equipment shipment and prior to installation, the contractor shall subject equipment to a thorough visual inspection. An FAA representative shall be notified in advance and afforded the opportunity to be present and witness this step. Nameplates and markers shall be checked against the required specifications, and deviations brought to the FAA's attention. At the FAA's request, quality control checks, including acceptable electrical measurements (such as cable insulation resistance tests) shall be performed and reported. After the installation of cable systems is completed, acceptance/commissioning tests shall be performed.

All equipment and materials shall be subject to acceptance through the manufacturers' certification of compliance with applicable requirements when so requested. The requirements of this standard shall be considered as minimum requirements and shall not relieve the contractor of the responsibility to furnish and install higher grades of materials than specified when so required by the contract drawings and specifications. The installation shall conform to the most stringent requirements of the National Electrical Code (NEC), the local electrical codes, NFPA-70E, and applicable ANSI and IEEE standards, e.g., the National Electrical Safety Code (NESC), as well as other relevant guides and standards as listed in Section 2.

3.3.2 Qualifications of personnel

3.3.2.1 Designers

The design team shall have at least one engineer with significant experience in medium voltage design, review, and construction management. The engineer shall have worked with electrical power systems, and shall have designed electrical distribution systems whose reliability, maintainability, availability, and fault tolerance are of a similarly high level to those found in campus environments such as hospitals, life safety systems, and/or large computer and telecommunication facilities. The design engineer shall have the ultimate responsibility for the construction set (specifications, drawings, and cost estimates) and installation quality control. Drawings and engineering documents published by a non-FAA entity shall be signed as approved by FAA Engineering Services or a representative of the PSG ELD/Power Cable Program upon design acceptance. Designers shall have experience in arc flash analysis, short circuit coordination (SCCS), and general electrical engineering experience.

3.3.2.2 Installation Crew

Experienced personnel regularly engaged in underground electrical distribution system work shall perform the installation. Personnel exclusively or mainly trained in overhead line work, or low-voltage facility wiring work, are not sufficiently qualified to install FAA medium-voltage underground electrical distribution systems. Only qualified personnel may work on electric circuit parts or equipment being installed.

A qualified person is one who has skills and knowledge related to the construction and operation of the FAA's electrical equipment and installations, and has received safety training to recognize and avoid the hazards involved. Management personnel shall be responsible for authorizing the qualified personnel to perform a task. Besides completion of Occupational and Safety and Health Administration (OSHA)/FAA required electrical safety training for qualified personnel, those persons authorized to work on FAA ELD systems shall meet the requirements of a Qualified Person as mandated by OSHA and as discussed in NFPA 70E.

Along with training, personnel performing medium voltage work on FAA ELDs shall have: (1) the skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment, including wire and cables, (2) the skills and techniques necessary to determine the nominal voltage of exposed energized electrical conductors or parts, (3) knowledge of the safe approach boundaries, work clearances, and voltages involved, (4) familiarity with construction and operation of equipment and the hazards involved, (5) familiarity with electrical safety related work practices and precautionary techniques, (6) familiarity with proper use of personal

protective equipment (PPE), arc flash, insulating and shielding materials, (7) familiarity with the proper use of insulated tools and test equipment, (8) ability to make good decisions in determining the degree and extent of the hazard and the PPE and job planning necessary to perform the task safely, (9) familiarity with safety precautions associated with confined spaces, (10) knowledge of skills and techniques regarding how to select and use a voltage detector and phase meter, (11) familiarity with mechanical aspects of ELD installation work such as trenching, boring, excavation around existing utilities and structures, manhole rigging, and pulling cable, and (12) CPR training and basic training for emergency dispatch if an electrocution or confined spaces injury occurs.

Cable termination and splicing shall be performed only by experienced and qualified medium/high voltage electricians experienced in underground distribution systems. The PMO shall assist in approving qualifications. Before cable splices/terminations are made, the FAA may request a sample splice and/or termination be made to demonstrate the electricians' qualifications.

Optional: To qualify the splicer, the sample splice and/or termination shall comply with the requirements of accessory manufacturers, and pass the requirements of IEEE standards 48, 386, and 404 with respect to partial discharge.

3.3.2.3 Inspectors and Testing Personnel

Inspectors of the FAA ELD distribution systems shall have knowledge and experience in quality control activities related to the inspection of cables laid in trenches such as are found at large campus environments such as hospitals, life safety systems, and/or large computer and telecommunication facilities; shall perform quality control activities during installation and preacceptance of medium and low-voltage switchgear, protective devices, power distribution transformers, surge arrestor equipment, and motor control centers; shall review functional tests of electrical equipment and conduct inspection and preacceptance of electrical drawings, termination drawings, and cable schedules; and shall interpret the various drawings used in the projects for executing and recording the work.

Test personnel shall be qualified persons meeting the requirements stipulated in Appendix C.

3.3.3 Receiving, storing, and protecting

The contractor shall receive, store, protect, and handle products according to National Electrical Contractors Association NECA 1, *Standard Practices for Good Workmanship in Electrical Construction*, and NECA/NEMA 605, *Recommended Practice for Installing Underground Nonmetallic Utility Duct.*

3.3.4 Sequencing and scheduling

The contractor shall:

1) Notify the FAA resident engineer to schedule inspection of each duct bank or duct bank segment before concrete is placed.

2) Provide the FAA resident engineer with reasonable notification before the anticipated date of acceptance testing of the newly installed replacement ELD system so that arrangements can be made.

3.3.5 Cable testing

3.3.5.1 Government-furnished cable

If government-furnished power cable is delivered to the contractor, the contractor shall test the cable on the reel and report electrical or physical cable defects within two weeks of cable receipt. If adequate cable lengths are unavailable for testing on the reel, a visual inspection shall be made and damage reported to the FAA. The required tests shall then be made immediately after unreeling. Defects discovered when installing the cable shall be reported to the FAA in accordance with the contract provisions.

3.3.5.2 Contractor-furnished power cable

Single and multi-conductor power cables furnished by the contractor shall conform to the FAA specifications given in the Products section of this specification.

Power cable shall meet the following minimum requirements:

a. Copper conductors.

d. Insulation shall be a premium quality, heat, moisture, ozone and corona resistant thermosetting ethylene propylene rubber or tree retardant cross-linked polyethylene, in accordance with ANSI/ICEA 94-649, Part 4, Classes I and II, Table 4-1. Insulation shall be consistent with type MV90 for dry and wet locations.

e. Insulation thickness and integrity. The insulation thickness shall be at the 133% level at the applicable voltage class and in accordance with the latest edition of ICEA S-94-649. The insulation shall be free from voids, contaminants, gels, and agglomerates in accordance with the latest edition of AEIC CS8 and ICEA S-94-649.

c. Neoprene, polyethylene, or vinyl jacket for normal areas, and polytetrafluoroethylene (PTFE) (Teflon®) jacket in areas exposed to fuel, oil, solvent or chemical leakage, excessive groundwater, or extremely acidic soil.

d. For power cables with rated voltages to 8 kV, cable insulation shall have a minimum continuous voltage withstanding capability of four times rated voltage. For rated voltages above 8 kV, insulation shall have a minimum continuous voltage withstanding capability of three times rated voltage. Cable voltage surge capabilities shall be 15 times rated voltage for voltages to 8 kV, nine times rated voltage for voltages above 8 kV through 15 kV, and seven times rated voltage for voltages above 15 kV through 25 kV. Whenever a cable is covered by applicable ICEA/NEMA specifications, the cable shall pass the test requirements for such cable. In addition, the installed cable shall satisfy after-installation acceptance tests as specified below, and in Appendix C.

3.3.5.3 Acceptance testing of new power cable

Following installation, the contractor shall perform cable testing in the presence of the FAA. The contractor shall furnish necessary test instruments except where otherwise indicated in the project plans. Only currently calibrated instruments shall be used for cable testing. A laboratory approved by the measurement instrument manufacturer, or an ISO/IEC 17025 or ANSI/NCSL Z540-1 accredited facility shall perform instrument calibration. When conducting FAA-authorized third-party testing, offline partial discharge testing shall constitute the final acceptance test after completion of the installation.

Testing shall be completed on contractor-installed cable before connection is made to existing cables. If warranted, the FAA will test existing cables and provide the results to the contractor through the resident engineer prior to the contractor splicing or connecting cables he has installed to existing cables.

Certain acceptance tests classified as "destructive" by the IEEE shall only be conducted on newly installed cables. Such tests shall only be conducted within the test constraints given in Appendix C. Destructive tests shall not be performed on in-service power cables.

3.3.5.4 Acceptance testing of new power cables above 2,000 volts

CAUTION
Zero-energy verification shall be accomplished before doing any work on de-energized medium-voltage equipment. In preparing for, and conducting, power cable tests, follow electrical safety procedures as outlined in FAA Order 6950.22.

New FAA underground, shielded, medium-voltage power cables rated 2,000 volts and above shall be subjected, after installation but before connection to terminal equipment, to the following acceptance tests:

a. Continuity test for cable conductor, shield, and armor, using an ohmmeter type instrument. See FAA Order 6950.22 for parameters and test equipment.

b. Limited-voltage DC insulation resistance test using a Megger™ type instrument. This test is formulated to apply and hold a DC voltage on the cable for a specified time, while measuring insulation resistance. See Appendix C for test description and processes.

c. One of the following tests:

a. Very low frequency (VLF, 0.1 Hz) AC high-potential withstand "pass/fail" test. The purpose of this type of test is not to ensure cable system future performance but simply to reassure the construction team that the line is not grounded/shorted before energization. The test shall be performed after cable system installation, including terminations and joints, but before the cable system is placed in normal service. See Appendix C for test description and procedures.

b. If third-party partial discharge acceptance testing is authorized, a diagnostic 50/60 Hz, off-line partial discharge test. This test can localize and determine the severity of any defects in the new installation. Due to its requirements for specialized test equipment, signal processing software, and diagnostic skills, the test must be conducted by a third-party testing firm. The testing firm shall be a qualified contractor preauthorized by the FAA. See Appendix C for test description and procedures.

3.3.5.5 Acceptance testing of new power cables 600 volts and below

CAUTION
Zero-energy verification shall be accomplished before doing any work on de-energized medium-voltage equipment. In preparing for, and conducting, power cable tests, follow electrical safety procedures as outlined in FAA Order 6950.22.

All low-voltage (≤ 600 V) power cables shall measure not less than 50 megohms resistance between conductors, and between conductors and ground (see FAA Order 6950.22, *Maintenance of Electrical Power Cables,* Chapter 3, *Standards and Tolerances,* Paragraph 301, Table (see column heading labeled "NEW CABLE"). Measurements shall be taken at not less than 500 volts DC and not more than 1,000 volts DC. This test does not constitute proof that the system is free from insulation defects but rather supplies evidence that the insulation was not damaged during the installation process.

3.3.5.6 Failure of power cable under test

If the contractor-furnished cable fails to meet test requirements after installation, the contractor shall repair or replace, at his expense, the sections of cable proven defective.

If the government-furnished cable fails to meet test requirements after installation due to contractor's faulty installation practices, the contractor shall repair or replace the defective sections of cable at contractor's expense.

The installation contractor shall be responsible for retest costs if components are found to be substandard during acceptance test(s) as a result of contractor faulty installation practices.

4. PRODUCTS

4.1 Product options and substitutions

Alternative products may be substituted for product types that do not apply to the project. Consult with the FAA project engineer.

4.2 Power cable

Single and multi-conductor power cables shall conform to the following specifications:

a. For branch circuits not exceeding 600 volts:
   i) Follow NEC Article 310.15 for ampacity ratings of conductors.
   ii) For conductors for branch circuits as defined in NEC Article 100, size conductors to prevent a voltage drop exceeding 3 percent at the farthest outlet of power, heating, and lighting loads, or a combination of such loads, and where the maximum total voltage drop on both feeders and branch circuits to the farthest outlet does not exceed 5 percent, provided that there is a reasonable efficiency of operation.
   iii) Follow NEC Article 215.2(A)(1), Note 2, for voltage drop on feeder conductors.

b. FAA-E-2793 for single and multi-conductor power cables used in exterior 2,000 to 35,000 volt applications. Reference Section 4.2 for product factory certified test result reporting requirement.

4.3 Transformers

4.3.1 Medium voltage transformers (>1,000 volts)

4.3.1.1 Transformer design

ELD transformers are normally installed outdoors with proper clearance from structures. Transformers shall be “enviro-friendly” biodegradable electrical insulating and cooling-liquid filled. Choose less-flammable transformer liquids unless there is a specific requirement to do otherwise.

If the local site stipulates less flammable transformer liquids, the following section shall apply, use NFPA 70 for liquids having a fire point not less than 300 degrees C tested per ASTM D92 and a dielectric strength not less than 33 kV tested per ASTM D 877. Provide identification of transformer as "non-PCB" and "manufacturer's name and type of fluid" on the nameplate. The fluid shall be a biodegradable electrical insulating and cooling liquid classified by UL and approved by FM Approvals® as "less flammable" fluids. The fluid shall meet the following properties:

- Pour point: ASTM D 97, less than -15 degree C,
- Aquatic biodegradation: EPA 712-C-98-075, 100%,
- Trout toxicity: OECD Test 203, zero mortality of EPA 600/4-90/027F, pass.

Silicon-filled and R-temp filled transformers shall not be used for less-flammable applications.

Transformers shall be pad mounted and of dead front design. Aluminum windings are acceptable. Due to associated safety hazards, transformers of the pole-mounted style shall not be used for ground-level FAA ELD applications.

Vaults shall be used for all transformer and switchgear applications wherever possible, eliminating the need for sweeps.

4.3.1.2 Transformer cabinets

Use heavy-duty stainless steel cabinets in most corrosive or rural windblown dust environments, unless otherwise specified. The manufacturer's standard construction material is acceptable only in noncoastal, noncorrosive environments not subject to windblown dust. For coastal/corrosive environments, ensure that front sill, hood, and tank base of single compartment transformers are corrosion resistant and constructed of stainless steel of not less than No. 13 U.S. gage, conforming to ASTM A167, Type 304 or 304L, unless otherwise indicated on the drawings.

In highly corrosive environments, the addition of totally stainless steel tanks and metering is required. This detail shall be outlined in the design drawings.

4.3.1.3 Warning signs and arc flash/shock hazard labels

For the enclosures of pad-mounted transformers having a nominal rating exceeding 600 volts, provide warning signs. After completion of arc flash hazard and shock analyses, label transformers with arc flash hazard and shock hazard warning information suitable to the particular installation. In any instance where it is anticipated that the transformer must be opened while energized, a warning label shall be provided.

4.3.1.4 Transformer losses

Transformers should meet the efficiency standards set forth in DOD's Unified Facility Guide Specification (UFGS) 26 12 19.20, *Single Phase Transformers,* Section 2.2.3.

4.3.2 Low-voltage transformers (≤600 volts)

In FAA ELD systems, dry-type distribution transformers are used for buck boost applications or for short point-to-point distances for small loads of 600 volts or less. When used indoors, refer to FAA Specification FAA-C-1217, *Electrical Work, Premises Wiring.*

Transformers shall be mounted to allow for adequate ventilation (suitable for the local ambient temperatures).

4.4 Switchgear

FAA ELD systems contain two types of switchgear: switch pads and sectionalizing switchgear. Both are fused devices used to de-energize equipment to allow work to be done and to clear

faults downstream. More importantly, they isolate faulted line segments from a distribution system. These units shall be dead front-type units.

- Low-profile switch pads are typically used for single-phase applications.
- Sectionalizing switchgear are typically used for three-phase applications.
- Pads or vaults shall be constructed of concrete or composite concrete material. Concrete is preferred, but the latter may be used if approved by the FAA Resident Engineer and included on the drawings.
- Risers and cabinets shall be of heavy duty construction and consist of materials based on geographic location. Applications in dry locations shall employ steel; in wet/corrosive/windblown dust locations, use stainless steel.
    - Use stainless steel risers and cabinets in most weather/climate/windblown dust exposed applications. The manufacturer's standard construction material or NEMA 3R are acceptable only in noncoastal, noncorrosive, nondusty environments. For coastal/corrosive/dusty environments, ensure that cabinets are corrosion resistant and constructed of stainless steel (4X), unless otherwise indicated on the drawings. Riser shall include any part of the equipment base or cabinet that is within 1.5 inches of the concrete pad.
    - Enclosures shall meet the requirements of ANSI C57.12.28.
- Vaults shall be used for all switchgear applications wherever possible, eliminating the need for sweeps.

4.5 Outdoor disconnecting means and exterior panel boards

4.5.1 Outdoor disconnecting means

A main disconnect switch (MDS) ensures that electrical service to a facility can be completely de-energized for service or maintenance (Figure 4.5.1-1). Use heavy duty MDSs.

- Enclosures--MDSs shall be outdoor rated or stainless steel, heavy duty. Enclosures shall be NEMA 3R for typical applications, NEMA 4X for corrosive/salt/windblown dust environments.
- Wiring Gutters--The minimum size of side wiring gutters shall be 4 in. for power feeders up to and including 100 amperes, 6 in. for power feeders over 100 amperes and up to 225 amperes, and 8 in. for power feeders over 225 amperes and up to 600 amperes.
- Pads--Pads shall be constructed of concrete or polymer concrete composite material. Concrete pads shall be no less than 6 in. thick. Concrete pads shall be brushed, chamfered, and graded for drainage.

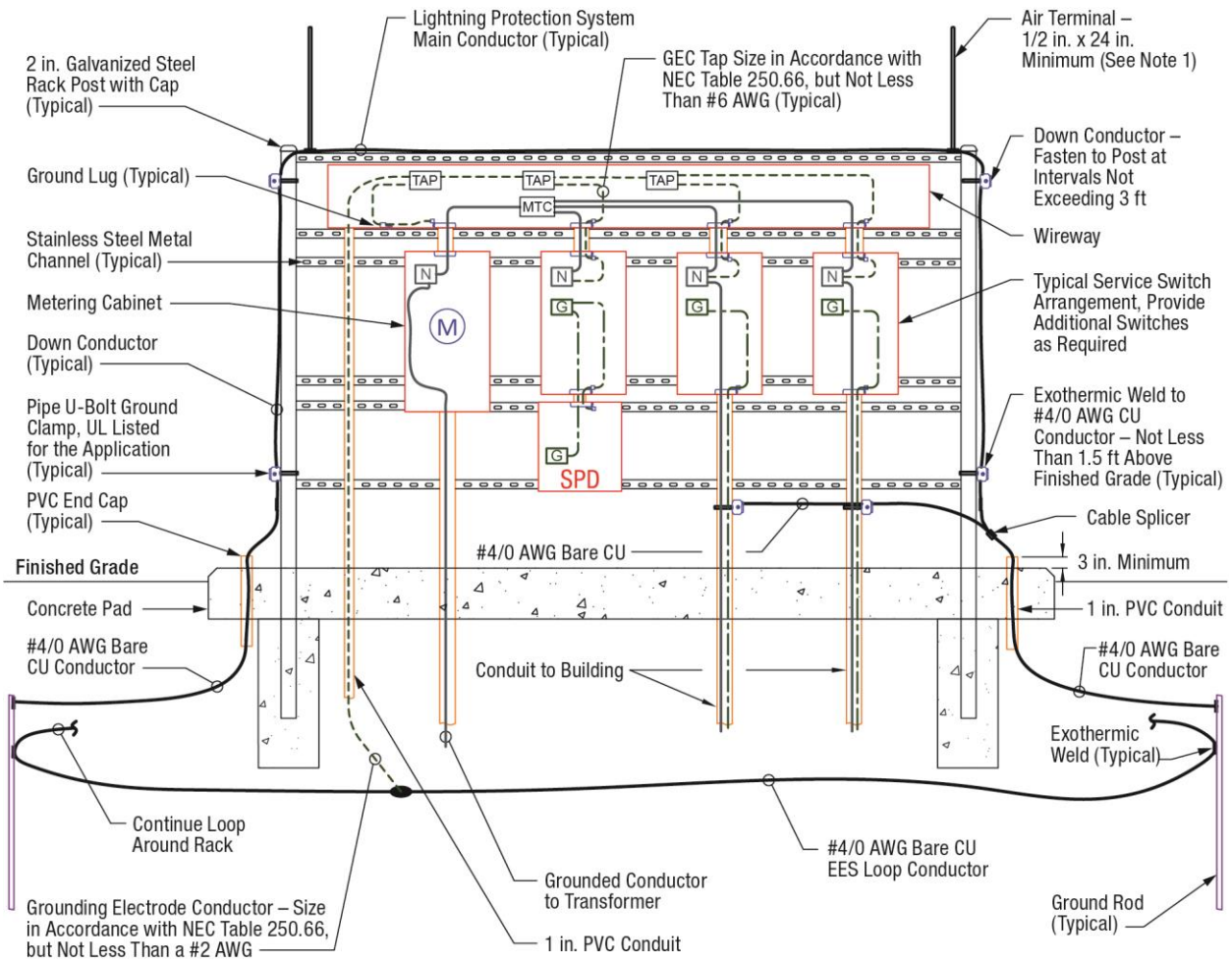


FIGURE 4.5.1-1. Typical ELD outdoor disconnecting means.

4.5.2 Exterior panel boards

Hinged-on-hinged panel boards are not required for exterior applications.

4.6 Terminations and splices

4.6.1 Terminations

All power cable terminations rated above 4,000 volts or with an outer shield shall be made with an authorized stress-relief device. Cable terminations shall be of a prefabricated design. Special care shall be exercised to provide the proper ratings and physical dimensions.

4.6.2 Splices

For medium voltage power cables (above 600 volts), use cold-shrink splice kits meeting ANSI/IEEE Std. 404 (for a 15 kV rating). For power cables below 600 volts, use heavy-wall self-sealing heat-shrinkable tubing meeting ANSI-C119.1-2006. Alternatively, use a poured epoxy splice, or any other splicing means approved by ANSI standards. The splice shall be approved by the lead FAA engineer or the FAA resident engineer.

4.7 Overcurrent protective devices

- For FAA ELD systems, the preferred protective devices are fuses. In transformers, fuses shall be immersion-type, current-limiting fuses, accessible from the exterior of the equipment.
- The specific type and size of protective device shall be selected based on a protective device coordination study and short circuit analysis, and as provided in the drawings.

4.8 Underground duct systems

The configuration of an underground duct system shall depend on the specific application. Conduit types used within FAA duct systems shall be of the size, material, and type indicated on the contract documents. Size of conduit shall always be indicated on the drawings. All conduit material shall be UL listed and installed in accordance with UL listings.

4.8.1 Concrete-encased rigid nonmetallic conduit

Rigid nonmetallic conduit consists of two types:

1) Concrete-encased Schedule 40 PVC conduit is preferred for ELD duct systems. Subject to FAA approval, to reduce costs or for special applications, direct-buried Schedule 80 PVC conduit may be used in lieu of concrete encasement.

2) High-density polyethylene (HDPE) with SDP rating of 11 is a rigid nonmetallic conduit commonly used for boring.

4.8.1.1 PVC conduit

PVC conduit shall meet the requirements of UL651 – *Schedule 40 and 80 Rigid PVC Conduit,* NEMA TC 2 – *Electrical Polyvinyl Chloride (PVC) Conduit.* Solvent-welded socket fittings shall meet the requirements of UL514C – *Non-Metallic Fittings for Conduit and Outlet Boxes,* and NEMA TC 3 – *PVC Fittings for Use with Rigid PVC Conduit and Tubing*.

4.8.1.2 HDPE conduit

HDPE conduit shall meet the requirements of ASTM F2160-10/ASTM 1962-11/NEMA TC7. Use standard dimension ratio (SDR) 11 HDPE conduit in all ELD installations. The SDR of a conduit is defined as the ratio of the average conduit diameter divided by the minimum wall thickness.

4.8.2 Plastic-coated steel conduit

4.8.2.1 PVC coated RGS

Where situations warrant, such as when runway and equipment shutdown impacts are a consideration, PVC coated RGS may be used in lieu of concrete encased PVC duct. This substitution must be annotated on the drawings. Direct-buried rigid galvanized steel shall be plastic coated. An acceptable alternative is RMC wrapped in half-lap fashion with pressure-sensitive 10-mil PVC-based corrosion protection tape.

PVC exterior coated, urethane interior coated, galvanized rigid steel conduit shall meet the requirements of NEMA RN 1 – *PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.*

4.8.2.2 Fittings and conduit bodies

Use 40 mil PVC exterior coated, urethane interior coated, zinc-plated, threaded, malleable iron meeting the requirements of UL514B – *Fittings for Conduit and Outlet Boxes,* and NEMA RN 1 – *PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit*.

4.8.3 Direct buried rigid nonmetallic conduit

Direct-buried, non-concrete-encased conduit shall be Schedule 80 PVC or HDPE.

For PVC, solvent-welded socket fittings shall meet the requirements of UL514C – *Non-Metallic Fittings for Conduit and Outlet Boxes,* and NEMA TC 3 – *PVC Fittings for Use with Rigid PVC Conduit and Tubing*.

Where HDPE conduit is used in direct buried applications, the conduit shall meet the requirements of ASTM F2160-10/ASTM 1962-11/NEMA TC7. Use standard dimension ratio (SDR) 11 HDPE conduit. The SDR of a conduit is defined as the ratio of the average conduit diameter divided by the minimum wall thickness.

4.8.4 Rigid metal conduit (RMC)

Above-ground exterior conduit shall be rigid steel conduit.

Conduit used in exterior applications such as in a power distribution rack shall meet the RGS requirements of UL6 – *Rigid Metal Electrical Conduit*, and ANSI C80.1 – *Rigid Steel Conduit, Zinc Coated*.

RMC fittings and conduit bodies shall meet the requirements of UL514B and ANSI/NEMA FB1.

Fittings: Follow NEMA TC 9, NEMA TC 14, and ASTM F-512.

4.9 Corrosion protection tape

Use pressure-sensitive, 10-mil-thick, PVC-based tape for corrosion protection of metal conduit and fittings.

4.10 Insulating bushings

Use NRTL-listed insulating bushings with 105º C rated insulation. Apply insulated protective caps to any unoccupied bushings. Dust caps shall not be used as substitutes for protective caps.

4.11 Grounding bushings

NRTL-listed, galvanized cast zinc fitting or malleable iron, 150º C rated insulated throat grounding bushings with lay-in type ground cable lugs.

4.12 Sweeps

All sweeps shall be PVC-coated or tape-wrapped rigid galvanized steel (RGS).

Do not provide sweeps into a manhole. Vaults shall be used for all transformer and switchgear applications wherever possible, eliminating the need for sweeps.

4.13 Duct spacers

Standard precast spacers (“chairs”) shall be used for duct support and alignment. Duct spacers shall provide a 3-inch separation between the conduit and the ground. There shall be a minimum of 3 inches of concrete on bottom, sides, and top of duct.

4.14 Duct plugs

In unused ducts, use soft, expansible gasket material compressed with non-metallic plates and bolts to produce a positive seal against water and gas.

4.15 Duct sealant

Do not use duct sealant within the duct bank system/conduits that interconnect the manholes. Only use duct sealant in and around conduits at the point they enter fixtures such as power equipment racks. Expanding foam sealants are not allowed.

Conduits entering a junction box or other electrical cabinets from underground shall be sealed with duct sealing compound at the point they enter the box or cabinet**.** Expanding foam sealants are not allowed for this purpose.

Conduit connections to the tops of exterior boxes, electrical cabinets, or switches shall be made with weatherproof hub fittings. For side and bottom entry points, use sealing locknuts.

4.16 Underground duct and cable warning tape

Furnish detectable underground warning tape for underground duct banks. Use aluminum-backed, 0.005 inch thick, underground warning tape with a red background color. Lettering shall be black and indicate the type service buried below:

"CAUTION BURIED ELECTRIC LINE BELOW"

Use tape width appropriate for the burial depth:

A. Three-inch wide tape for up to 18 inches depth.
B. Six-inch wide tape for up to 24 inches depth.

All direct buried cable shall be marked with extrusion-laminated underground marking tape. Tape shall be a minimum of six inches (6”) wide and shall run continuously in the cable trench six inches (6”) below the surface or as indicated on the project plans. Tape shall be bright red, and constructed of solid 100% pigmented plastic, and not an ink-coated plastic.

4.17 Pull wires and tape

For spare ducts, specify ¼ inch pull tape or nylon jet line having a minimum tensile strength of 210 pounds for non-metallic conduit. The FAA project engineer may specify a larger or more specialized pull tape (impregnated lubricant, distance marking, etc).

4.18 Precast electrical manholes and hand holes, accessories

4.18.1 Manholes and hand holes

Precast reinforced concrete electrical utility structures shall be of the size and shape as detailed on the drawings in conformance with ASTM C-858 – *Standard Specification for Underground Precast Concrete Utility Structures*. Electrical manholes are typically used for medium-voltage systems and are 4’ long, 4’ wide, and 4’ high, or as shown on the drawings. Electrical manhole sections shall conform to ASTM C-478. Electrical hand holes are typically used for low-voltage systems and are 3’ long, 2’ wide, and 30” high, or as shown on the drawings.

4.18.1.1 Manholes/hand hole structures, frames, and lids

4.18.1.1.1 Airports handling aircraft with maximum departure/takeoff weight of 30,000 lb and above--For airports with a design aircraft maximum departure weight of 30,000 lb and above,* manholes/hand holes, frames, and lids located within the airport runway/taxiway safety areas (RSA/TSA) shall be of the aircraft-rated type, designed and certified for 100,000 lb (45,000 kg) wheel loads with 250 psi (1.72 MPa) tire pressure. (Refer to FAA Advisory Circular

150/5320-6, Appendix 3, *Design of Structures for Heavy Airplanes*). Clearly indicate on the drawings underground utility structures that will be subject to aircraft loading. For planned future-expansion projects where manholes and hand holes are projected to fall within RSA and TSA boundaries, those structures shall be aircraft rated.

Outside the RSA/TSA, H-20 highway-rated manhole and hand hole components are permitted, provided an adequate proof load safety margin for the cover/cover frame is met. First, live loading shall meet basic H-20 loading requirements per A.A.S.H.T.O. HB-17, *Standard Specifications for Highway Bridges*. The live load shall be that loading which produces the maximum bending and shear moments in the structure. H-20 design wheel load is a minimum of 16,000 pounds, or 80 psi. For the safety margin, the cover/cover frame must meet AASHTO M306, which requires that it pass a proof load test of 40,000 lb applied on a 9x9-in. pad in the center of the cover/cover frame. H-20 rated utility structures that do not meet the above requirements shall not be used.

Manholes that consist of two sections shall be joined at the site to provide a watertight joint using a preformed flexible sealant as specified in ASTM C-990. A twelve inch (12 in.) diameter sump, four inches (4 in.) deep, shall be cast in the center of the manhole floor and supplied with a cast iron cover.

Manhole floor shall be cast integral with walls to form the bottom ring. Furnish a keyed joint between the bottom ring and top ring. Manhole roof shall be a one-piece concrete cap.

*Airports handling dual-wheel-landing-gear aircraft up to 60,000 lb maximum departure weight are permitted to use highway-rated manholes/hand holes and components in the RSA/TSA because the wheel load is distributed over four tires (60,000 ÷ 4 = 15,000 lb). Adequate safety margins must be met through proof loading. Refer to the H-20 loading requirements specified above.

4.18.1.1.2 Airports handling aircraft maximum departure/takeoff weight of 30,000 lb or below-- For airports with a design aircraft maximum departure weight of 30,000 lb or below (60,000 lb if dual-wheel landing gear), manholes/hand holes, frames, and lids located both within and outside the airport runway/taxiway safety areas (RSA/TSA) shall be of the highway-rated type, provided a safety margin for the manhole casting is added. Live loading shall be for H-20 loading with adequate safety margin as described in Section 4.18.1.1.1 above. Clearly indicate on the drawings underground structures that will be subject to aircraft loading.

For planned future-expansion projects where manholes and hand holes are projected to fall within RSA and TSA boundaries, and the expansion is expected to accommodate heavier aircraft with maximum departure/takeoff weight of 30,000 lb and above (60,000 lb if dual-wheel landing gear aircraft), those structures shall be aircraft rated. Concurrently, existing non-aircraft-rated manhole/hand hole structures throughout the airport's RSA/TSA areas shall be retrofitted with aircraft-rated structures and components.

Outside the RSA/TSA in non-vehicular traffic areas, other types of enclosure structures (e.g., polymer concrete, nonreinforced concrete, or other) may be used provided (1) they meet ANSI Tier 22 (design/ test = 22,500/33,750 lb) specifications, and (2) have been approved by the FAA resident engineer.

Manholes that consist of two sections shall be joined at the site to provide a watertight joint using a preformed flexible sealant as specified in ASTM C-990. A twelve inch (12 in.) diameter sump, four inches (4 in.) deep, shall be cast in the center of the manhole floor and supplied with a cast iron cover.

Manhole floor shall be cast integral with walls to form the bottom ring. Furnish a keyed joint between the bottom ring and top ring. Manhole roof shall be a one-piece concrete cap.

Manhole markings--Identify electrical power manholes and hand holes by "FAA Power" markings cast in the steel cover, or so identified with a die stamped, nominal one sixteenth inch (1/16") minimum thickness copper plate, brazed or fastened to the cover with a minimum of two 10-32 brass machine screws.

4.18.2 Manholes accessories

Frame and lids--Use heavy duty cast iron manhole frame with solid lid, or other FAA approved manhole cover. Lid may be spring loaded. Alternatively, lid may consist of partitioned aircraft-rated lid segments, each segment capable of being lifted separately, facilitating easier and safer access.

Racks--Cable racks and cable support arms shall be furnished in the quantities and locations indicated by the drawings for each manhole. Racks shall be made of nonmetallic material (for example, PVC, plastic, or UL-rated glass-reinforced nylon). Saddle arms shall be as per the approved project drawings. Splices and cables shall be attached to cable racks.

4.19 Grounding cables

Depending on the application, ELD exterior grounding conductors shall be of the type and size required by applicable sections of FAA-STD-019.

4.20 Ground rods

Ground rods ("grounding electrodes") shall be three quarter inch (3/4") by ten foot (10') long copper or copper-clad steel.

4.21 Weather heads on risers, drip loops

Risers feeding FAA owned underground distribution systems shall have weather heads installed. Each weather head shall have drip loops that loop no less than 6" below the weather head.

4.22 Electrical equipment enclosures

Bases and cabinets of electrical equipment shall be of heavy-duty construction consisting of materials suitable to their geographic location.

Typical, dry, non-dusty environments--For typical dry conditions, mild steel (3R) bases and enclosures may be used. These provide protection against rain, sleet, and snow in outdoor applications.

Corrosive, wet, or windblown dust environments—For typical wet (or wet and salt-corrosive) conditions, and in rural areas subject to windblown dust, use stainless steel (4X) bases and enclosures.

For transformers installed in highly corrosive environments, the addition of totally stainless steel tanks and metering is required.

4.23 Equipment vaults and pads

Follow the drawings for specification and construction details of equipment foundation support structures. Specific applications are as follows:

4.23.1 Equipment vaults

For pad-mounted transformers and switchgear, use precast concrete vaults to facilitate ease of transition from duct bank system to transformer and switchgear termination points. Concrete shall meet or exceed a 28-day compressive strength of 4,000 psi.

4.23.2 Concrete pads for transformers and switchgear

Foundations of poured concrete pads for larger size transformers (>50 kVA) shall have a minimum thickness of 6 inches, unless otherwise specified on the drawings. Thicker pads than 6 in. may be considered in areas subject to frost heave. Concrete shall meet or exceed a 28-day compressive strength of 4,000 psi.

4.23.3 Concrete pads for power distribution racks

Foundations of poured concrete pads shall have a minimum thickness of 6 inches, unless otherwise specified on the drawings. Thicker pads than 6 in. may be considered in areas subject to frost heave. Concrete shall be chamfered, brushed, and graded for drainage. Concrete shall meet or exceed a 28-day compressive strength of 4,000 psi.

Prefabricated concrete pads with cutouts for conduit can be used where frost heave is prevalent. Install cables in conduit and leave a slack length of cable in case the pad is displaced upward by ground frost. Where pad cutouts are present, expansion couplers on protruding conduits should be considered in areas prone to frost heaving or ground settling.

4.23.4 Composite concrete equipment pads

Composite concrete equipment flat pads and box pads shall not warp, support flame, rust, or be UV degradable. Flat pads shall have a waffle bottom design to permit loose earth to fill bottom voids to level and stabilize the pad. Pads shall not be affected by asphalt, road salts, fertilizers, transformer oil, other common chemicals, weather, sunlight or other normal service conditions to which they may be exposed. Composite pads shall be capable, with equipment installed, of withstanding temperature variations of -40 degrees C (-40 degrees F) to +65 degrees C (149 degrees F) without cracking, splitting, or deforming. They shall not be designed and constructed so as to trap or hold water and shall be able to withstand repeated freeze-thaw cycles.

4.23.4.1 Lightweight polymer concrete equipment pads

If approved by the FAA Project Engineer, lightweight polymer concrete (LPC) flat pads and box pads that provide sufficient strength-to-weight ratios may be used. The pads shall have cutouts and preinstalled mounting hardware as required. No extra equipment is required to lift the pads into position. LPC pads shall meet or exceed a compressive strength of 11,000 psi per ASTM C579-96, a flexural strength of 1,800 psi per ASTM C580-93, and a modus of elasticity of 2,900,000 psi per ASTM C580-93. LPC pads/boxes shall also pass chemical resistance and impact resistance tests in accordance with ASTM C267-97 and D2444-93. LPC pads shall also meet NEC, ANSI/SCTE 77, and UL listing requirements.

4.23.4.2 Fiber reinforced concrete equipment pads

If approved by the FAA Project Engineer, fiber reinforced equipment pads may be used. Fiber reinforced pads shall be composed of cement mortar reinforced by alkali resistant glass fibers. The material shall incorporate a minimum of 4 percent by volume of alkali resistant glass fibers. The pads shall have cutouts and preinstalled mounting hardware as required. Fine aggregates shall conform to ASTM C33. Box pads shall have a minimum compression strength of 7500 psi after 28 days and flexural strength of 3200 psi. Box pad material shall meet or exceed the following results when tested under ASTM D695-08: peak load 1,187 lbf, peak stress 2,125 psi, and modulus 391 ksi. Pads shall meet or exceed a side wall deflection of .037” with 2,000 lb applied. Flat pads shall have a minimum compressive strength of 6,000 psi after 28 days.

4.24 Bollards

Bollards shall be used only where it is necessary to protect electrical equipment and enclosures from field vehicle damage or other mechanical damage. Bollard use and placement shall be as specified on the drawings or as determined by final location of equipment. Unless otherwise specified, use 4-in. diameter steel pipe filled with concrete. Bollards shall be placed 3 ft deep and extend 4 ft above ground level. Premanufactured plastic jackets shall cover each bollard.

5. EXECUTION

5.1 Scheduling of work

Scheduling of all work, including any airport runway impact, shall be part of the construction contract requirements. This specification shall serve as a reference specification to the construction contract.

Airport runways must remain in operation during certain periods. Contractors shall proceed in a manner that produces minimum disruption to the FAA and airport operations. During construction activity, contractors shall coordinate work through the FAA Resident Engineer, the airport authority, air traffic control tower, airport security, and other contractors as defined by the contract documents. Work performed within the RSA/TSA of an active runway may require runway/taxiway closing. Advance notice of proposed work near an active runway shall be required to be given by contractors to the FAA.

5.2 Existing FAA buried cable and ducts

5.2.1 FAA documentation

The contract documents define the drawing format used by the FAA to record the location of buried cable and ducts. The contractor shall use the FAA format during the course of work to ensure the accurate location of the new installations as described on the FAA drawings. Drawings and engineering documents published by a non-FAA entity shall be approved by the FAA project engineer.

5.2.2 FAA marking of known buried cables and ducts

All known FAA power, FOTS, control, and telecommunications cables leading to and from an operating facility shall be marked in the area of work by the FAA for the information of the contractor before starting work. The FAA will mark these cables once for the contractor. It shall be the contractor's responsibility to maintain these markings throughout the course of the project. Airport mowers may be expected to be in use by airport personnel throughout the duration of the work, keeping markers visible. FAA is responsible for marking FAA cables ONLY. The contractor shall be responsible for marking other cables and utilities in the work areas through a third party location service.

5.2.3 Other buried cables, ducts, piping and items

Locating utilities--The contractor shall be responsible for contacting the utilities prior to starting work and for confirming the location of existing utilities and other items that may be buried in the area of work. Along an area suspected of having utilities of any sort, the contractor shall hand dig or use other authorized low-impact digging system such as potholing. The airport authority shall be contacted to locate those items owned or known by the airport to exist.

Avoiding buried structures--The contractor shall take precautions to protect existing underground (buried) items including but not limited to fuel tanks; water lines; buried control, telecommunications, FOTS, and power cables; ducts; and structures. Buried items shall be protected from damage for the duration of work. The contractor shall immediately repair, with equal material by skilled workmen, those items damaged by the contractor or subcontractor.

Procedure for making repairs during installation--Prior authorization from the FAA shall be obtained for the materials, workers, time of day or night for making repairs, method of repairs, and permanent repairs the contractor proposes to make. In the event of inadvertent damage, the contractor shall immediately stop work and notify the FAA and utility when appropriate. Repair work shall be inspected and authorized by the FAA with the concurrence of the affected utility company, airport, or other owner(s) of the damaged item(s).

Replaced cables—Replaced cables shall trace the same routing path as previously employed. Should there be a need to divert from the previous route, careful planning shall be exercised, especially in areas where utilities, communications, control, and NAVAIDS systems such as Glide Slope and Localizer facilities are installed or planned to be installed in the future. Approval from the office of primary interest is required.

5.3 Safety during construction and testing

All necessary site work included in the overall scope of work, from delivery to site to final authorization, shall undergo a safety risk assessment. A detailed, site-specific, Safety Risk Assessment shall be submitted by the FAA Project Engineer for final authorization no fewer than 3 weeks prior to commencement of on-site work. During construction, installation, and testing, the contractor shall comply with the safety rules of FAA (FAA Order JO 3900.XX, FAA Advisory Circular AC 150/5370-2) and those dictated by OSHA (Part 1926), NEC, ANSI/IEEE, and ANSI C2 (the NESC). The contractor shall be responsible for the implementation of FAA-authorized items in the Safety Risk Assessment document.

5.4 Excavation and trenching

The following are general excavation and trenching requirements. Note paragraphs that follow for particular requirements for either (1) direct earth buried cables, or (2) underground duct cables.

5.4.1 Depth requirements

IEEE ANSI C2 (part of the National Electric Safety Code) specifies the minimum legal depth requirements for medium-voltage power cable during installation. Tailoring organizations shall evaluate site-specific requirements and follow the following standards in order of precedence: (1) IEEE ANSI C2, then (2) paragraphs below, then (3) local standards if applicable.

Conduits shall meet the following minimum standards:

a. Unless otherwise specified due to soil conditions or other circumstances, cables, conduits, and ducts shall be buried to the minimum depth to their top as specified by the following paragraphs b through g. In the event that achieving the minimum depth is not feasible, follow the direction of the FAA Resident Engineer.

b. Top of direct-earth buried (DEB) conduit or cables 600 volts and below shall be a minimum of twenty four inches (24") below finished grade, per ANSI C2 (see Table I), unless local conditions and regulations require deeper burial, in which case the contractor shall advise FAA about these conditions and regulations before proceeding with the construction.

TABLE I. Burial depths for DEB cable
(source: ANSI C2)

Voltage (phase to phase)	Depth of burial	
	(mm)	(in.)
0 to 600	600	24
601 to 50,000	750	30

c. Top of direct-earth-buried conduit or cables over 600 volts shall be a minimum of thirty inches (30") below finished grade, per ANSI C2 (see Table I), unless local conditions and regulations require deeper burial, in which case the contractor shall advise FAA about these conditions and regulations before proceeding with the construction.

d. If finished grade has not been established before the cable trenches are excavated, it is the contractor's responsibility to determine what the final finished grade elevation will be and excavate the trench deep enough to meet the depth requirements at the end of the project.

e. Underground concrete-encased duct, and duct consisting of PVC Schedule 80, HDPE with SDP rating of 11, or RGS conduit, shall be installed so that the top of the conduit is buried at not less than twenty-four inches (24") below finished grade.

f. Additional requirements for all ducts: concrete-encased duct, rigid steel conduit, or PVC conduit shall be installed so that the top of the conduit is buried as follows:

1. When installed under runways, not less than thirty inches (30") below the bottom of paving, or as specified by the airport authority,

2. When installed under taxiways, not less than thirty inches (30") below the bottom of paving, or as specified by the airport authority,

3. When installed under other paved areas, in accordance with Table I or as required by the local jurisdiction.

4. For railroads and state-owned highways, at the minimum depth below grade as specified by those entities.

5. Where local conditions require unusually deep burial of ducts, contractor shall discuss the situation with the FAA project engineer and obtain preauthorization.

g. In northern climates where deep trenching is cost prohibitive as determined by the FAA, use a standard depth of not less than 24 inches (24") from top of duct, cable, or conduit to finished grade.

h. Cables shall not be direct buried under paved areas, runways, taxiways, roadways, railroad tracks, or ditches. Where cables cross under roads or other paving exceeding 5 feet in width, such cables shall be installed in rigid steel conduit, concrete-encased PVC, steel conduit, or high-density polyethylene (HDPE) conduit, as defined by the contract documents. Where cables cross under railroad tracks, such cables shall be installed in accordance with the requirements of the railroad authority. Cables under railroad grades may be installed in reinforced concrete-encased ducts, rigid galvanized steel sleeves, or HDPE conduit, subject to the requirements of the railroad authority. HDPE must be of sufficient crush strength to withstand expected static and dynamic loads over the expected lifetime of the cable without deformation. For directional boring under railroad and roadway grades, standard dimension ratio (SDR) 11 shall be used. The SDR of a conduit is defined as the ratio of the average conduit diameter divided by the minimum wall thickness. When installing direct buried cable, ducts shall extend at least 1 foot beyond each edge of paving and at least 5 feet beyond each side of railroad tracks.

i. Where direct burial cable transitions to duct-enclosed cable, direct-burial cables shall be centered in duct entrances, and a waterproof nonhardening mastic compound shall be used to facilitate such centering. Cables may be pulled into duct from a fixed reel where properly sized rollers are provided in the trench. Where cable is placed in duct (for example, under paved areas, roads, or railroads), ducts shall be made to slope in order to drain.

j. Where cuts are made in paving, the paving and subbase shall be restored to their original condition.

5.4.2 Survey requirements

5.4.2.1 Recording of data

The ELD project record shall consist of (a) information entered in computer-aided design and drafting (CADD) systems, (b) manual plotting onto the FAA drawing set, (c) Global Positioning System (GPS) data, (d) Geographic Information System (GIS) information or databases, and/or (e) other appropriate documentation as set forth in the contract documents.

Placement of markers--Drawings shall record positions of markers placed on top of direct earth buried (DEB) cable trenches. The markers shall be identified on the drawings by a small circle with a "P" in the center for power cable, "C" for control/fiber cable, "R" for coaxial cable, "S" for special purpose points, and "T" for telecommunications cable.

DEB cable--DEB cable trenches shall be identified on the drawings with text boxes pointing to the trench indicating what is in the trench. If there are several cables in the trench, each cable shall be called out. Power cables shall be identified both by the actual working voltage of the cable and the cable insulation rating. Anything unusual, peculiar, or unique about the cable runs shall also be called out in the drawings.

Duct banks--Duct banks shall be plotted on the drawings. Duct banks that are installed for future use shall have text boxes pointing to them indicating that they are future-use duct banks.

Manholes, hand holes, and splices--Manholes shall be identified on drawings by a small square with an "MH" in the center. Hand holes shall be identified by a small square with an "HH" in the center. Where manhole and hand hole numbers are provided on the contract drawings, they shall also be called out on the completed cable drawing. Splices made in manholes and hand holes shall be shown on the cable drawings.

Abandoned cables—If possible, the contractor shall indicate on the as-built drawings the locations of abandoned cables in places where they affect the excavation of new trenching, such as at points of intersection with other structures, including runways, taxiways, concrete pads, utility pathways, roads, etc.

5.4.2.2 Survey points

The contractor shall record the survey point of each manhole using GPS coordinates. At each major change of direction of the cable circuit, a manhole shall be installed and its location surveyed and recorded. Surveying and data gathering for this purpose shall be completed before a trench or structure is backfilled.

If for some reason the cable path deviates from a straight line between manholes, the deviation should be recorded as a survey point, using GPS coordinates, on the drawings for future reference. Where the cable terminates to a building, a transformer, an antenna, a light bar, an outside demarcation cabinet, power distribution rack, or other similar device, the survey shall include the GPS coordinates of the device or facility at the point where the cable terminates.

Special-purpose points--Special-purpose points may be used to indicate points such as splices or entrances to duct banks in records and on the drawings. Special-purpose points shall be accompanied by a text box to describe the function of the specific point.

5.5 Underground duct systems

Power distribution cables at FAA installations shall be installed in underground duct systems. Unless preauthorized per the drawing set and construction specifications, direct earth burial (DEB) of power distribution cables is prohibited. If preauthorized, any DEB construction shall meet the requirements in Section 5.6.

5.5.1 Preparation and excavation for underground ducts

In preparing to install underground ELD ducts, contractor shall meet the industry standards given in this section. Contractor shall also work with FAA to contact the owner for their requirements, coordinating underground ELD duct work to avoid interference with other airport projects and existing utilities. The contract specifier shall work with the Power Cable (ELD) Program Office to ensure coordination of work with other FAA programs that may have an interest in using the same duct system or trench.

The contractor shall excavate trenches for underground ducts as follows:

a. To the depth specified in paragraph 5.4.1.

b. Install underground duct bank systems according to the NEC, the NESC, NECA/NEMA 605 (*Recommended Practice for installing Underground Nonmetallic Utility Duct),* ANSI/IEEE C2, and other requirements in this section.

c. Verify routing and termination locations of duct banks before excavation for rough-in.

d. Verify that field measurements are as shown on the drawings.

e. Position trench so concrete envelope of duct banks have minimum horizontal and vertical separations from parallel or perpendicular runs of other utility pipes or conduits (see Table II. Use Table II as a baseline, but always coordinate with local utilities for their requirements).

Note: Measurements are guides only; check with local authorities and the utility owners for their specific requirements.

f. Make trenches of sufficient width to receive work to be installed and provide specified concrete coverage on sides.

g. Conduit or castings required under roadways or railroads shall be installed by boring. Jacking of conduit is not allowed. Conduits bored under roads off airport property shall be a minimum of 30 inches (30”) below finished grade, or as required by the local jurisdiction.

h. Backfill excavations for duct banks and manholes in 6-inch layers using excavated soil. Remove roots, rocks and sharp objects. Furnish coarse sand as required for additional backfill material.

i. Moisture-condition backfill soil and compact to 95% of maximum density under paved areas and 90% of maximum density under unpaved areas.

j. Firmly tamp backfill.

k. Restore area.

TABLE II. Spacing of power cable ducts from other utilities.

UTILITY TYPE	PARALLEL LINES	PERPENDICULAR CROSSINGS
Water	36 inches horizontal separation	24 inches
Gravity Sewer	36 inches horizontal separation	24 inches
Force Main Sewer	36 inches horizontal separation	24 inches
Storm Drain	36 inches horizontal separation	24 inches
Natural Gas	60 inches horizontal separation	24 inches
Steam or Hot Water	60 inches horizontal separation	24 inches
Communications	24 inches horizontal separation of tamped soil or 3 inches of concrete. *No separation required for fiber optic cables.*	12 inches vertical separation of tamped soil or 3 inches of concrete
Electrical	12 inches horizontal separation of tamped soil or 3 inches of concrete	12 inches vertical separation of tamped soil or 3 inches of concrete

5.5.1.1 Connecting requirements for HDPE conduit running through and emerging from a bore

When placing HDPE conduit underground through a bore, use one continuous length of flexible HDPE conduit. In instances where a continuous run of conduit is not possible, individual sections shall be joined using heat-welded (fused) connections. After emerging from a bore, the HDPE will typically terminate in a manhole at both ends.

To join lengths of conduit together after emergence from a bore, follow these procedures:

a. If the emerging HDPE conduit is to be joined to PVC conduit, the HDPE conduit section shall be run into the bell end of the PVC conduit and cemented using a special bonding agent (Table III) (see Appendix F for a sample two-part bonding product). Adhesives typically used for connecting PVC segments are not of sufficient strength for HDPE-to-PVC transitions and shall not be used. Alternatively, the HDPE conduit may be connected to a PVC coupling on the end of a length of PVC conduit. The point of transition shall then either be (1) encased in concrete together with the remaining run of

PVC, or (2) direct earth buried, depending on the type of burial method used for the rest of the run.

b. Connection details involving HDPE conduit shall be shown on the drawings.

TABLE III. Adhesive minimum pullout-force requirements for bonding HDPE to HDPE and HDPE to PVC conduit materials.

Conduit Diameter	Polyethylene Conduit to PVC Standard Coupling	
	Coupling length	Pullout Force
1 inch	2 ⅛ inch	760 lb
1 ½ inch	2 ⅜ inch	1,140 lb
2 inch	2 ½ inch	1,520 lb
4 inch	3 ¾ inch	4,560 lb

5.5.2 Backfilling

Backfilling material and procedures depend on the design used, whether concrete-encased duct or direct buried conduit. Consult FAA Advisory Circular AC 150/5370-10 for construction details.

Trenches shall be completely backfilled and tamped level with the adjacent surface. When necessary to obtain the desired compaction, backfill material shall be moistened or aerated. When sod is to be placed over a trench, backfill shall be stopped at a depth equal to the thickness of the sod to be used. Excess excavated material shall be removed in accordance with the contract documents. If approved, allow the trench to be backfilled with concrete, flush with the surface.

5.5.3 Restoration

Restoration shall be in accordance with local airport authority requirements, or as otherwise stated in the contract statement of work. Where it has been removed, soil shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the trenching, storing of dirt, cable laying, pad construction, and other work shall be restored to the original condition.

Restoration shall include the necessary grading, seeding, sodding, sprigging, or hydroseeding as required to restore the disturbed area to match the adjacent area. Where trenching cuts through paved areas, the surface shall be properly backfilled and resurfaced with paving similar to the original paving, or with concrete, as the drawings specify.

Resurfaced areas shall be level with original paving, free from cracks, and capable of withstanding full traffic loads without settling or cracking. The contractor shall be held responsible for maintaining all disturbed and restored surfaces until final acceptance by the FAA.

5.5.4 Duct installation

Cable duct banks shall be installed outside of the airport runway/taxiway safety areas (RSA/TSA), as well as ILS critical areas, to the greatest extent possible. Where trenching is required through an RSA or TSA area, place the manholes to the farthest extent possible outside the RSA and TSA while still maintaining standard spacing and directional change requirements as noted elsewhere in this specification. For locations of RSA/TSA/ILS areas, consult with the FAA Project Engineer and/or the local airport owning authority. (See also FAA Order JO 6750.16, *Siting Criteria for Instrument Landing Systems*, and FAA Advisory Circular 150/5300-13, *Airport Design*, particularly Chapter 6, *Navigation Aids [NAVAIDs] and On-Airport Air Traffic Control Facilities [ATC-F]*).

When there is an immediate change in direction of a duct system, a manhole or hand hole shall be installed. Any gradual change in direction (e.g., a gradual arc of the duct) shall require the approval of the resident engineer prior to installation.

Do not use duct sealant within the duct bank system/conduits that interconnect the manholes. Only use duct sealant in and around conduits at the point they enter fixtures such as power equipment racks. Expanding foam sealants are not allowed.

5.5.5 Manhole and hand hole installation

5.5.5.1 Manhole installation

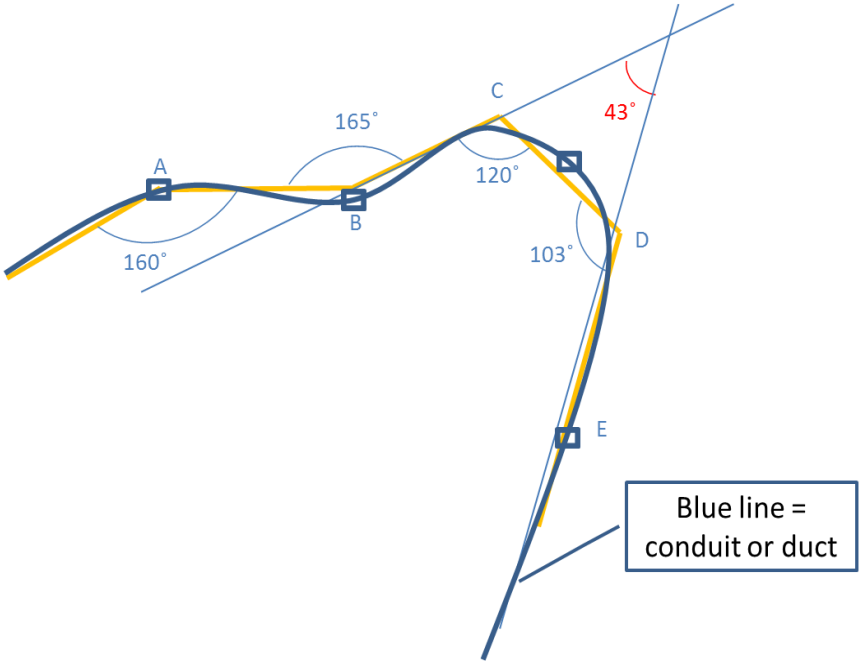
Install manholes every 600 feet. Where there are long continuous, straight runs, manholes may be placed up to 1200 feet apart with preapproval of the project engineer. When there is a planned change in direction of the conduit between manholes of greater than 45 degrees (cumulatively within a run), an additional manhole shall be installed in place of the directional change (Figure 5.5.5.1-1).

The top of the completed manhole shall be set above finish grade in unpaved areas to prevent water from ponding on the manhole. Place the top of the manhole 2 inches (2”) above grade, plus or minus 1 inch (1”). Grade the backfill material downward and away from the manhole. A one-eighth-inch (1/8”) per foot fall from the manhole top to finish grade, ten feet (10’) from each edge of the manhole is recommended.

The manhole lower half shall be set on a four-inch (4”) bed of crushed stone on undisturbed earth. Add a layer of geotextile fabric between the gravel and earth to enhance soil stability and prevent settling of the manhole. The contract drawings will define any additional requirements where soil bearing capacities are an issue or concern.

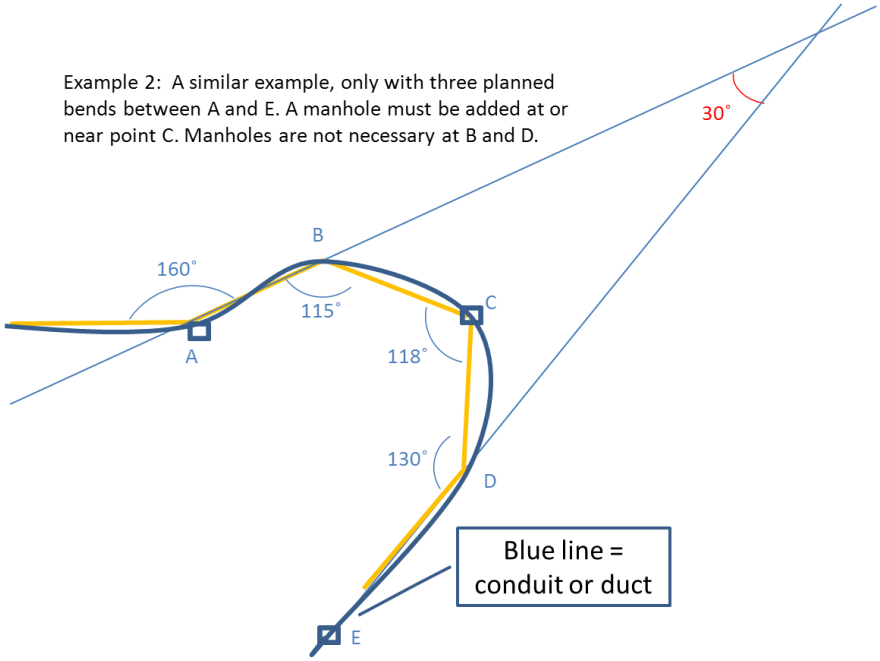
Backfill around the manhole in lifts commensurate with the soil and compact each backfill lift to the density of the surrounding earth.

Example 1: Bends at points A and B are greater than 45 degrees and are proper. Bends at planned manholes C and D each individually are greater than 45 degrees and are nominally proper, but in combination, they form a virtual angle of less than 45 degrees. Therefore, a manhole is required between points C or D. Measured angles shall take into account entrance and exit angles of the duct if entering or leaving a manhole or hand hole.



(A)

Example 2: A similar example, only with three planned bends between A and E. A manhole must be added at or near point C. Manholes are not necessary at B and D.



(B)

FIGURE 5.5.5.1-1. Adding a manhole at points of tight radius of a duct or conduit.

5.5.5.2 Hand hole installation

The top of the hand hole shall be set above finish grade in unpaved areas to prevent water from ponding on the hand hole. A one eighth inch (1/8") per foot fall from the manhole top to finish grade, ten feet (10') from each edge of the hand hole is recommended.

The hand hole shall be set on a four-inch (4") bed of crushed stone on undisturbed earth. Add a layer of geotextile fabric between the gravel and earth to enhance soil stability and prevent settling of the manhole. The contract drawings will define any additional requirements where soil bearing capacities are an issue/concern.

Backfill around the hand hole in lifts commensurate with the soil and then compact each lift to the density of the surrounding earth.

5.5.5.3 Equipment manhole and hand hole conduit penetrations

Where a steel conduit penetrates a wall of a manhole or hand hole, a grounding bushing shall be installed. In medium-voltage manholes and hand holes, these grounding bushings shall be connected to each other and to the earth ground system with 6 AWG tinned bare copper conductors. In low-voltage hand holes, the grounding bushings shall be connected to the circuit equipment grounding conductor.

5.5.6 Mandrel requirements

The contractor shall mandrel each duct or conduit installed and each existing duct or conduit in which cable is installed or replaced. As each conduit run is completed, proceed according to the following steps:

a. For conduit sizes 3 inches (3") and larger, draw a flexible testing mandrel approximately 12 inches (12") long with a diameter less than the inside diameter of the conduit through the conduit. Next, draw a stiff bristle brush through until conduit is clear of particles of earth, sand, and gravel; then immediately install conduit plugs.

b. For conduit sizes less than 3 inches, draw a stiff bristle brush through until conduit is clear of particles of earth, sand, and gravel; then immediately install conduit plugs (see UFGS 33 71 02.00 20).

c. If the mandrel fails to pass through the duct being tested, either the duct is obstructed, misaligned, or the curve has too small a radius. If obstructed, use a high-pressure water jet to clear the conduit. Defective duct(s) shall be exposed and the defect corrected. After the duct(s) are repaired, repeat the mandrel test in that section of duct.

5.5.7 Spare ducts

Spare ducts shall only be used for power and nonmetallic fiber optic telecommunication systems (FOTS) cables. Jet line or pull tape shall be included in the duct.

5.5.8 Duct protection

All power cable ducts shall be securely fastened in place during construction and progress of the work, and shall be plugged daily at the end of work to prevent entrance of foreign material. A duct section having a defective joint shall not be installed.

All concrete-encased power cable ducts shall be raised at least 3 inches off the bottom of the trench using spacers ("chairs"). Bottom spacers may be secured to nominal one inch (1") boards to prevent sinking and overturning. This step shall be followed by a monolithic pour of concrete. Where two or more ducts are encased in concrete the contractor shall space them at not less than one and a half inches (1-1/2") (measured from outside wall to outside wall) using spacers applicable to the type of duct. As the concrete pour progresses, concrete not less than three inches (3") thick shall be placed around the sides and top of the duct bank. Interlock spacers shall be used every five feet (5') to ensure a uniform spacing between ducts.

Joints in adjacent ducts shall be staggered a minimum of twenty four inches (24") apart and shall be made completely waterproof prior to covering with concrete.

5.5.8.1 Concrete mix specification

Concrete for ELD structures such as pads and vaults shall have a minimum 28-day compressive strength of 4,000 psi. Concrete for concrete-encased ducts shall have a minimum 28-day compressive strength of 2,000 psi.

5.5.9 Ducts without concrete encasement

Trenches for single-duct power cable runs shall be no less than six inches (6") or more than twelve inches (12") wide, and the trench for two or more ducts installed at the same level shall be proportionally wider. Trench bottoms for ducts without concrete encasement shall be made to conform accurately to grade to provide uniform support for the duct along its entire length. A three inch (3") layer of bedding material shall be placed around the ducts. The bedding material shall contain no particles that would be retained on a half inch (1/2") sieve. The bedding material shall be tamped until firm. When two or more ducts are installed in the same trench without concrete encasement, they shall be spaced not less than two inches (2") apart (outside wall to outside wall) in a horizontal direction, or not less than six inches (6") apart (outside wall to outside wall) in a vertical direction.

Do not use duct sealant within the duct bank system/conduits that interconnect the manholes. Only use duct sealant in and around conduits at the point they enter fixtures such as power equipment racks. Expanding foam sealants are not allowed.

5.5.10 Separation of cables in duct

If installing communication, control, or signal cables in the vicinity of power cables, consult first with the FAA office of primary responsibility for guidance.

For the purposes of this document, “duct” is defined as a set of parallel-running conduits. Together, conduits make up a duct or ductbank system. Subject to the approval of the FAA project engineer, separation of cables installed in conduit or duct shall be as follows:

a. Power cables of the same circuit shall be installed in the same conduit.
b. Conductors of circuits rated 600 volts nominal or less, ac circuits, and dc circuits shall be permitted to occupy the same equipment wiring enclosure, cable, or raceway. Conductors shall have an insulation rating equal to at least the maximum circuit voltage applied to a conductor within the enclosure, cable, or raceway, NEC 300.3 (C)(1).
c. Conductors of circuits rated equal to or greater than 600 volts nominal shall not occupy the same equipment, wiring enclosure, cable, or raceway with conductors of circuits rated less than 600 volts nominal unless preauthorized by the FAA project engineer and as permitted in NEC 300.3 (C)(2).
d. Except in circumstances authorized by the FAA project engineer, power cables shall not be installed in the same duct systems with communication, control, and signal cables. Communication, control, and signal cables may be installed without separation from each other.
e. If joint-use applications with communication, control, or signal cables are authorized, power cable shall be installed in its own separate conduit. The conduit shall be separated a minimum of three inches (3”), outside wall to outside wall, from conduits that contain communications, control, and signal cables. The actual separation for each specific case shall be stipulated by the FAA project engineer.
f. Where cables of different types (i.e., power and control or signal) or different voltages are jointly installed as above, the individual cables or groups of cables shall be clearly and unambiguously identified by voltage and type.
g. Fiber optic, communications, and control cables shall have clearly identified and marked hand holes, pull boxes, and junction boxes that are completely separate from power cable manholes.

5.5.11 Installation of cables

To minimize splicing, the longest practicable lengths of cable shall be pulled into the ducts at one time. Unless otherwise specified, electrical power manholes and hand holes shall be as far apart as practicable based on the pulling specification of the cable installed. Typically, manholes and hand holes are installed 600 ft apart and at all points where directional change of the duct system is greater than 45 degrees. For long, straight, continuous runs, spacing may be increased, not to exceed 1,200 ft, provided cable manufacturer’s specifications for pulling tension has been met, and subject to the project engineer’s oversight. To meet grounding requirements of underground multigrounded neutral cable systems over 1,000 V, under no condition shall the distance between manholes or hand holes exceed 1,200 ft in accordance with ANSI C2 (NESC), Rule 96C, standard.

Splicing lengths of cables of different construction types together is not allowed. For example, do not connect shielded cable to concentric cable, or shielded cable to old unshielded cable. Exceptions to this rule will require written PSG approval before installation.

Where a power cable duct or conduit crosses a runway or taxiway, manholes and hand holes shall be placed just outside the RSA/TSA boundaries on opposite sides of the crossing. This will allow for adequate working space to avoid penetrating the safety areas during installation and maintenance activities.

The contractor shall verify that the duct is open, continuous, and clear of debris or blockage (use mandrel) before installing cable. Cable shall be installed in a manner to prevent harmful stretching of the conductor or damage to the outer protective covering or conductor insulation. Until connections are made, cable ends shall be sealed using adhesive-lined, heat-shrink end caps. Where more than one cable is to be installed in one duct, cable shall be pulled at the same time. In no case shall a splice be pulled into a duct or conduit.

When cable cutting is required, cable ends shall be effectively sealed against moisture immediately after cutting, using end caps as above. Bends of a radius less than eight (8) times the diameter for rubber-covered or plastic-covered cable, or twelve (12) times the diameter for metallic armored cable, shall not be made. Cable that has been kinked shall not be installed.

When unreeling, an observer shall be stationed at the reel to report cable irregularities. Unless specifically stated in the drawings, cables for installation in ducts or for direct burial shall comply with FAA-E-2793A. Specifically excluded are bare concentric neutral wire cable types. If communications or fiber optic cables are present in the same manholes and hand holes as medium voltage power cables, fire wrap the power cables.

5.5.12 Cable pulling

The below provisions on cable pulling shall be followed unless otherwise specified on the submittals matrix (Appendix E).

The contractor shall obtain from the manufacturer an installation manual or set of instructions that address such parameters as cable maximum allowable pulling tension and maximum allowable sidewall bearing pressure.

When requested by the project engineer, the contractor shall provide pulling calculations and a pulling plan, which shall be submitted along with the manufacturer’s instructions. Cable shall be installed strictly in accordance with the cable manufacturer's recommendations, ANSI/IEEE C2 standards, and the authorized installation plan.

In addition to any data or calculations required by the project engineer, the pulling plan shall include at a minimum:

a. The cable manufacturer and type of cable.

b. Maximum allowable pulling tension on each different type and size of conductor, and maximum allowable pulling tension on pulling device (see UFGS-33 71 02.00 20).

c. Cable sidewall bearing pressure.

Prior to pulling cable, pump the water out of the manholes and pull a mandrel/swab 1/4 inch smaller than the duct diameter through duct run to ensure adequate opening of duct run. Thoroughly swab conduits to remove foreign material before pulling cables.

Cables shall not be pulled from an outdoor (exterior) location when the outdoor (exterior) air temperature is below the cable manufacturer's minimum recommended pulling temperature.

Contractor shall furnish required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment is to include, but be not limited to, framework, sheaves, winches, cable reels and/or cable reel jacks, duct entrance funnels, pulling tension gauge, and similar devices.

The diameter of the sheaves shall be at least 10 times that of the diameter of the largest cable. Equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices which may move or wear in a manner to pose a hazard to the cable shall not be used. Cable installation may be accomplished using a power winch or by hand.

Cable pulling lubricant shall be used to ease pulling tensions. The lubricant shall be compatible with the jacket material. The FAA project engineer will authorize the lubricant type used. Lubricant shall be water or silicone based so as not to injure the cable material used. Wax-based lubricants are not allowed. Lubricant shall not harden or become adhesive with age. Petroleum grease shall not be used.

Cable ends shall be sealed and firmly held in the pulling device during the pulling operation.

Use of a tensiometer or dynamometer is required for cable-pulling operations. Actual pulling tensions shall be continuously monitored. If actual pulling tension exceeds maximum pulling tension by 30% or more, the pulling operation shall be suspended and the project engineer consulted for investigation of a possible pulling obstruction or other anomaly. The cable pulling operation shall not exceed maximum allowable pulling tension. See Figure 5.5.12-1.

During pulling operations, several personnel shall be stationed at key points to ensure safety to cable and personnel: at duct entry, duct exit, cable feed, and at the pulling machinery.

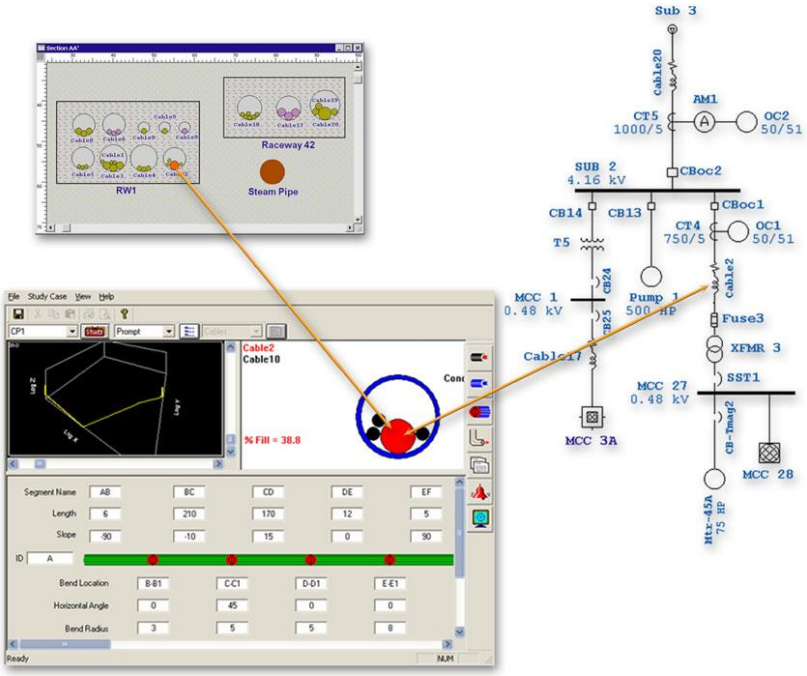


Diagram courtesy of ETAP Cable Systems Software

FIGURE 5.5.12-1. Industry software is readily available to assist with pulling calculations.

Avoid abrasion and other damage to cables during installation. The surface of a cable sheath or jacket shall not be damaged to a depth greater than one tenth ($1/10^{th}$) the original thickness or be flattened out-of- round more than one tenth ($1/10^{th}$) of the outside diameter.

Where cables are left in manhole or switchgear overnight or more than 8 hours prior to termination, the cable ends shall be sealed with paraffin or shrink wrap caps and supported in a manner which will prevent entrance of moisture into the cable. Cable shall be terminated and energized as soon as possible.

Table IV lists example maximum pulling tensions for commonly installed cables (see also Appendix B for a pocket guide on calculation methods).

The table is for illustration purposes only; it is the designer's and/or installer's responsibility to obtain the manufacturer’s data for the cable chosen for installation. The manufacturer’s data shall be used in conjunction with the pull-configuration(s) proposed, cable type and ampacity, size of conduit, distance, grade, degree of sweeps/bends, proper lubricant, etc, to calculate the maximum tension for each cable pull. The resulting value shall not exceed cable maximum tension and maximum sidewall pressure values.

TABLE IV. Maximum allowable non-armored power cable pull tensions using tensiometer/dynamometer and rope.

CABLE	TENSION (Pounds)	ROPE DIAMETER (INCHES) Cotton	Manila	Dacron	Nylon
2 - 1c #8 Solid	264	3/16			
3 - 1c #8 Solid	264	1/4	3/16		
4 - 1c #8 Solid	422		1/4		
2 - 1c #6 Stranded	420	1/4	3/16		
3 - 1c #6 Stranded	420	5/16	1/4		
4 - 1c #6 Stranded	672	3/8		3/16	
1 - 2c #8 Stranded	264	1/4			
1 - 3c #8 Stranded	396	1/4			
1 - 4c #8 Stranded	528		1/4		
1 - 2c #6 Stranded	420	1/4	3/16		
1 - 3c #6 Stranded	630	5/16			
1 - 4c #6 Stranded	840	3/8	5/16	3/16	
1 – 1c #4 Stranded, Conc Neut (CN)	334	For pull rope sizes, consult manufacturer (etc)			
2 – 1c #4 Stranded, CN	668				
3 – 1c #4 Stranded, CN	1,002				
4 – 1c #4 Stranded, CN	1,069				
3 – 1c #2 Stranded	1,593				
4 – 1c #2 Stranded	1,699				
3 – 1c #2 Stranded, CN	1,856				
4 – 1c #2 Stranded, CN	1,962				
3 – 1c #1/0 Stranded	2,534				
4 – 1c #1/0 Stranded	2,703				
3 – 1c #1/0 Stranded, 600 V	2,955				
4 – 1c #1/0 Stranded, 600 V	3,124				

Legend: No. of cables - No. of conductors (c)/ Gauge (AWG)
Note: The above figures are to be used as a guide only. Consult with the manufacturer for exact maximum pull tensions for a given cable type. Ensure conformance with the ANSI/IEEE C2 standards.

5.6 Direct earth buried cables

Direct earth buried (DEB) cables are to be avoided. However, if preauthorized per the FAA-approved drawing set and construction specifications, DEB cable construction shall meet the following requirements. Coordinate underground power cable installation work to avoid interference with other airport projects and with existing utilities.

General--The contractor shall excavate trenches for direct-earth burial cable as follows:

a. To the depth specified in paragraph 5.4.1b.

b. To a width of not less than four inches (4") for single or six to eight inches (6-8") for multiple runs of power cable.

c. To a width and depth that will provide horizontal or vertical separation of power cables from other power cables of different voltage ratings, or from power cable and a control or signal cable.

d. Where soil is known to be rocky, select backfill for cable protection. Backfill shall be firmly tamped in the separation area.

e. Restoration shall be in accordance with paragraph 5.5.3.

Unless otherwise specified, power cables in the same location and routed in the same general direction shall be installed in the same trench. Trenches for cables may be excavated manually or with powered trenching equipment. Cable plows shall not be used unless express permission is granted by the FAA project engineer. When rock is encountered, remove to a depth of at least 3 inches (3") below the cable and fill the space with sand or clean earth free from particles larger than 1/4 inch. Bottoms of trenches shall be smooth and free of stones and sharp objects. Where materials in bottoms of trenches are other than sand, a 3-inch layer of sand shall be laid first and compacted to approximate densities of surrounding firm soil. Trenches shall be in straight lines between cable markers. Bends in trenches shall have a radius of not less than 36 inches (36") consistent with the cable manufacturer's published minimum cable bending radius for the cable installed. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed.

Trenches shall be opened only for the time required to install, inspect and survey the cables in accordance with FAA Advisory Circular 150/5370. The trench shall be closed in the same working day or marked, barricaded and/or lighted according to current airport specifications and requirements.

Installation in trench--Direct earth burial cable shall be unreeled in place along the sides of or in trenches and carefully placed on sand or earth bottoms. Pulling cables into direct-burial trenches from a fixed reel position shall not be permitted, except as required to pull cables through conduits under paving or railroad tracks. Dragging cables over the ground shall not be permitted.

Separation of cables--Separation between direct earth burial cables shall be as follows:

a. Power cables may be laid together in the trench. In these instances, there shall be a minimum of 3 inches (3”) of separation between cables.

b. Non-power cables (fiber optic, communications, and control cables) shall be installed in a separate trench from power cables (exception: DEB power cable crossing a control cable at the perpendicular and with 12 inches [12”] vertical separation). A concrete marker indicating the presence of power cables shall be installed along the route of the trench.

c. Where cables of different types (power and control or signal) or of different voltages are installed together as stated in (a) and (b) above, the individual cables or groups of the same type cables shall be clearly and unambiguously identified by installing metal or approved plastic tags indicating the type (power, control or signal) and voltages for power cables. These tags should be installed in accordance with Section 5.12.

d. Backfill that serves to separate cables shall be firmly tamped.

Bends--Bends in cables shall have an inner radius not less than those specified in NFPA 70 for the type of cable, or manufacturer's recommendation.

Splicing--Where splices are required, provide splices designed and rated for direct burial. See splicing Section 5.9 for instructions. All splices shall have their neutrals/shield solidly grounded.

Slack loop--A slack loop shall be provided at each end termination point of a cable to facilitate any future repairs. Slack loops shall have no bends with an inner radius less than twelve times the outside diameter of the cable. Where cable is brought above ground, additional slack shall be as shown by the drawings or as directed by the FAA.

Backfilling--After underground medium-voltage DEB cable has been installed and inspected, the trench shall be backfilled. The first layer of backfill shall be 3 inches (3”) deep, loose measurement, and shall be either earth or natural sand containing no material aggregate particles that would be retained on a one quarter inch (1/4”) sieve. This layer shall not be compacted. The second layer shall be 9 inches (9”) deep, loose measurement, and shall contain no particles that would remain on a one inch (1”) sieve.

The remainder of the backfill shall be excavated or imported material (if necessary) and shall not contain stone aggregate larger than 4 inches (4”) maximum diameter. The second and subsequent layers shall be thoroughly tamped and compacted to the density of the adjacent undisturbed soil.

Thermal resistivity--Trench backfill shall have a soil thermal rho of 90°C-cm/W or less.

Screening/sieving-- Compacted trench backfills shall meet ASTM D422 and ASTM D698, shall be sufficiently compacted, and shall not have backfill lifts that are too thick. Failure to prepare backfill properly will result in degraded thermal capability of the cable system.

5.7 Cable installation in manholes

Cables shall be carefully formed on nonmetallic racks around the interior of manholes or hand holes, avoiding sharp bends or kinks. Ensure that enough cable is coiled in the manhole so that a number of splice repairs can be made without having to fully enter the manhole. Tie splices and cables to cable racks using one eighth inch (1/8") nylon line. Splices shall be a minimum of two feet (2') from the mouth of the duct opening into the manhole or hand hole. Where this is not possible, splices shall be located as advised in the manhole/hand hole specification or drawing. Splices in different cables shall be staggered.

5.8 Cable terminations, connections, surge protection, and fault protection

5.8.1 Cable terminations and connections

Installation of prefabricated cable terminations shall strictly conform to manufacturer's installation recommendations using proper specialized tools. Special care shall be exercised to use the proper ratings and physical dimensions.

5.8.2 Connections to a three-phase engine generator

When providing single-phase backup power to other facilities, connect the two new single-phase legs to the lowest loaded phases of the generator. The lowest loaded phases shall be determined by performing a load reading. This reading shall be confirmed by referring to the history of the technical performance record (TPR).

5.8.3 Surge protection

Apply surge protection in accordance with the following standards:

a. For FAA-owned low voltage power systems (600 volts and below) at or after the facility service entrance, surge protection devices (SPD) shall be applied in accordance with FAA-STD-019.

b. In ELD installations, a fused disconnect switch may be installed before the SPD and connected to the line side of the service.

c. Surge protection for the 1,000 V to 15 kV medium voltage range shall be implemented in accordance with ANSI/IEEE C62.11 and NEC Article 280.

The following guidelines apply to locating and installing surge protection devices (SPD) (see Appendix A for product operating parameters).

a. If an FAA-owned distribution transformer is fed from an overhead line by means of a medium voltage cable, surge arresters of the metal-oxide varistor (MOV) type shall be

installed at the pole top and at the transformer between each phase and ground. The pole type arrester shall be of the intermediate class, while the transformer surge arrester shall be of the distribution type. The continuous voltage rating of the arresters shall be determined in a protection and insulation coordination study. As a further protection against direct lightning, intermediate arresters shall be installed one span before and after the interconnection of transformer. Surge arrester leads connecting to cable conductor and grounded metal shield must be as short as possible to minimize the protective voltage level. This recommended surge protection scheme is illustrated in Figure 5.8.3-1.

b. If an FAA-owned distribution transformer is fed from a station transformer directly by means of a medium voltage underground cable, a distribution arrester shall be installed at both ends of the cable in accordance to the guidelines provided in paragraph (a) above.

c. Install surge arresters of the proper class on transformers.

d. Unless otherwise shown on the drawings, surge arresters are not required on medium-voltage switchgear.

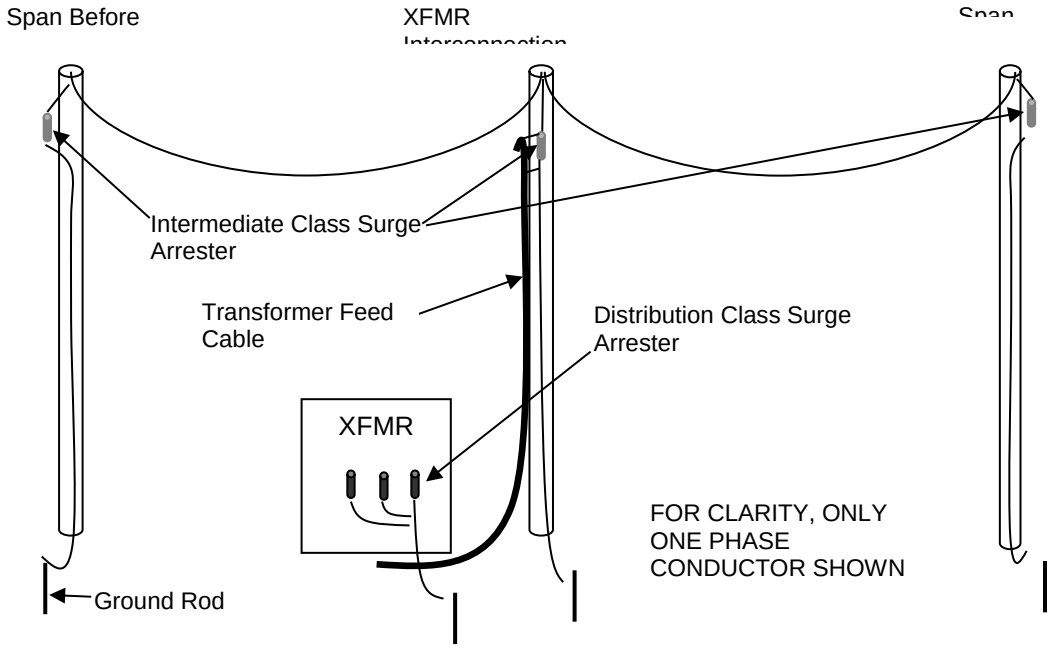


FIGURE 5.8.3-1. Schematic representation of recommended surge protection system.

5.8.4 Fault isolation

Use sectionalizing switchgear to protect the underground electrical line distribution circuit as a whole from electrical faults. This shall be accomplished by isolating faults to single National Airspace System (NAS) facilities versus multiple facilities ("daisy chained"). Where existing power cable layouts do not permit the isolation of individual facilities, add a sectionalizing switchgear.

Similarly, do not connect transformer primaries in a given electrical line distribution (ELD) service together in parallel such that a single power cable or transformer fault upstream will be allowed to de-energize downstream loads in the ELD circuit, thereby disabling multiple NAS facilities.

5.9 Splices

Avoid splices wherever possible; instead, use a mid-span grounding kit instead of a splice. Stagger splices on multiple cables in a trench. Keep cable ends to be spliced free from moisture by using tape or caps. When conducting FAA-authorized third-party testing, at the completion of the installation of each cable section (from termination to termination), subject the cable section to a 50/60 Hz partial discharge test in accordance with IEEE 400.3 at up to 2.5 times operating voltage level for a duration not to exceed 30 seconds, while the cable section is disconnected from the rest of the system. Any partial discharge within a splice shall comply with the requirements of IEEE 404. Splices are not to be drawn inside of any conduit or duct.

Buried and nonseparable T and Y joints shall not be used. These joints are inherently unreliable and cannot be properly commissioned with partial discharge diagnostics. Finding a fault becomes more difficult and harmful to existing cable assets. In addition, faults due to these types of unreliable joints can cause failures in multiple facilities due to a lack of sectionalizing.

Each cable splicer shall be qualified in making cable splices and in the use of specified cable splicing kits and specialized tools. The contractor shall obtain FAA authorization of the splice and cable splicer prior to making field splices. Cable splicing methods and materials shall be of a type recommended by the splicing materials manufacturer for the cable to be spliced. Splices shall be as follows:

a. FAA medium voltage power cables (above 600 volts). Use cold-shrink splice kits. The contractor shall make sure that the proper kit and tools are used for each application. The cold shrink product shall meet ANSI/IEEE Std. 404 (for a 15 kV rating).

b. FAA power cables 600 volts and below. Use heavy-wall self-sealing heat-shrinkable tubing meeting ANSI-C119.1-2006, poured epoxy splice, or any other splicing means approved by ANSI standards.

c. Cable armor and shields. Follow splice kit manufacturers' directions.

d. Evaluation of products. As a submittal to FAA, the contractor shall provide the product drawings showing details of the splicing methods used. In addition, products shall meet the latest editions of standards in Table V.

TABLE V. Cable splicing specification equivalents.

APPLICATION STANDARD	LEVEL OF ACCEPTANCE
IEEE-404 Standard for Power Cable Joints	Meet or Exceed
IEEE-48 Standard for Cable Terminations	Meet or Exceed
ANSI C119.1 Sealed Insulated Underground Connector System Rated 600 Volts	Meet or Exceed
IEEE – 386 Standard for Separable Insulated Connectors	Meet or Exceed

5.10 Power distribution racks, disconnect switches, junction boxes, and electrical cabinets

Power distribution racks - If vertical supports for power distribution racks supporting disconnect switches are separated by more than 6 feet, add a middle (third) vertical support. Where required by the FAA, use bollards to protect the installation from vehicle impacts.

Main disconnect switches – Ensure that installed MDSs meet heavy duty NEMA 3R for typical applications, heavy duty NEMA 4X stainless steel for coastal/corrosive/dusty environments. Construct pads of concrete, or use prefabricated composite pads.

Lightning protection of power distribution racks – At least one air terminal shall be installed on each power distribution rack, regardless of rack width or proximity to a zone of protection of other nearby facilities. Air terminal selection and grounding shall conform to FAA-STD-019.

Conduits entering a junction box or other electrical cabinets from underground shall be sealed with duct sealing compound at the point they enter the box or cabinet**.** Expanding foam sealants are not allowed for this purpose.

Conduit connections to the tops of exterior boxes, electrical cabinets, or switches shall be made with weatherproof hub fittings. For side and bottom entry points, use sealing locknuts.

5.11 Grounding of ELD systems

Local published standards may take precedence over the national standard. In the case of ambiguity or significant deviation, contact Power Services Group, Power Cable Program Office, to provide a technical evaluation. ELD system grounding shall comply with FAA-STD-019, NFPA 70, IEEE C2, and in accordance with the specific guidance provided herein.

1) Typical FAA medium-voltage ELD elements to be grounded include:

   a. Power Cables – ground the multigrounded neutral wires and shields,
   b. Guard wires,
   c. Manholes and hand holes,

d. Equipment and equipment enclosures,
e. Surge arresters,
f. Steel conduits and fittings based on application,
g. Direct earth buried power cables – multigrounded shields,
h. Abandoned power cables
    i. In duct and manhole systems, ground the conductor(s) and the multigrounded neutral wires and shields (if present) at both ends.
    ii. DEB cables shall be cut back 10 feet below grade and buried, with no requirement to ground the cable.
    iii. Document the section that was cut back as "abandoned" on as-built drawings.

2) Typical FAA low-voltage ELD elements to be grounded include:

a. Low-voltage cable segment between a facility transformer and the service entrance,
b. Service entrance disconnects, meter bases, and associated equipment,
c. Power distribution racks,
d. Abandoned low-voltage power cables in manholes/hand holes. These shall be grounded in the manhole, or removed. Document the section that was cut back as "abandoned" on as-built drawings.
e. Abandoned DEB low-voltage power cables shall be cut back 10 feet but do not require grounding. Document the section that was cut back as "abandoned" on as-built drawings.

5.11.1 Power cables, multigrounded neutral wires and shields

The FAA ELD systems follow the same practice as multigrounded (solidly grounded) medium voltage neutral systems in common use by the electric utility companies.

FAA power cables (both in conduit and DEB) shall be effectively grounded by ground connections of sufficiently low impedance levels. Cables shall also have sufficient current carrying capacity to limit the buildup of voltages to levels below those that may result in undue hazards to persons or connected equipment.

Multigrounded system—FAA medium voltage cables typically use metallic shields that require grounding (NEC requirement). The shields confine electric fields within the cable to obtain uniform radial distribution of the electric field, protect against induced voltages, and reduce the shock hazard risk to personnel. To effectively ground the shield, install multiple grounds to the cable neutral conductor to limit the voltage rise to 25 volts maximum (measured from neutral to earth ground) per IEEE Std 525. This shall be accomplished by connecting the neutral of the multigrounded system to electrodes at each transformer location and at a sufficient number of additional points totaling not less than four ground points in each mile of the entire line (every 1300 ft / 400 m [¼ mile], or less), not including grounds at individual services. This rule applies to underground jacketed shielded cable and to jacketed concentric neutral cable. (Ref NESC Section 9, Rule 096, *Ground Resistance Requirements – Multigrounded System).* The same practice applies to different kinds of cables; for example, concentric wire, tape shield, etc.

Bonding across joints--Apply a shield bonding jumper wire across cable splices.

Service Laterals--For low-voltage service laterals, when two disconnects are separated by 200 feet or more, neutral-to-ground bonds are required at both locations in accordance with the national electrical safety code (NESC). When the distance is less than 200 feet, the disconnect closest to the transformer shall have the neutral to ground bonded. Typically, this is the first disconnecting means in accordance with the National Electrical Code (NEC). Consider ground impedance when installing systems with long runs to ensure that circuit breakers trip as expected under fault current situations. The installer shall demonstrate the adequate performance of the circuit breakers to the FAA.

5.11.2 Cable guard wires

Guard wires protect the power cable from lightning surges. The contractor shall install cable guard wires for all buried cables and conductors not routed in ferrous conduit, in accordance with FAA-STD-019e, Section 4.2.1.5.

> **Exception:** Guard wires are not required for penetration under runways, taxiways, or topographical features, including boring under buildings, creeks, rivers, lakes, shore approaches, roadways, congested areas, environmentally sensitive areas, landscaping, terrain, and obstacles, or for 15 kV concentric neutral power cables in concrete-encased duct systems and constructed in accordance with Sections 5.5.7 and 5.5.8 of this specification. This exception does not apply to concrete-encased PVC duct bank containing communication, data, or control cables, or to spare ducts that do not contain a corrugated inner duct reserved exclusively for fiber optic cables.

A 1/0 AWG bare copper stranded guard wire shall be used. The guard wire shall be embedded in the soil a minimum of 10 inches (25 cm) directly above, centered and parallel to the cable and/or duct to be protected.

When the width of the cable run or duct does not exceed 3 ft (90 cm), one guard wire centered over the cable run or duct shall be installed. When the cable run or duct is more than 3 feet (90 cm) in width, two guard wires shall be installed. The guard wires shall be spaced at least 12 inches (30 cm) apart and not be less than 12 inches (30 cm) or more than 18 inches (45 cm) inside the outermost wires or the edges of the duct.

The guard wire shall run continuously along the cable/duct run with no deviations from the run of the duct, and with no gaps. The guard wire shall be bonded to the earth electrode system (EES) at each end and to ground rods at approximately 90-foot intervals using exothermic welds. The spacing between ground rods shall vary by 10% to 20% to prevent resonance. Install the ground rods approximately 6 feet (2 m) on alternating sides of the trench and connect them via jumper wire to the continuously running guard wire as shown in Figure 5.11.2-1. The jumper wires shall be swept away from the guard wire in a repeatable pattern such that a lightning impulse will always be able to follow a curved path to ground within 180 ft. of any point along the run. Maintain a minimum 9-in. radius bend in the jumper sweeps.

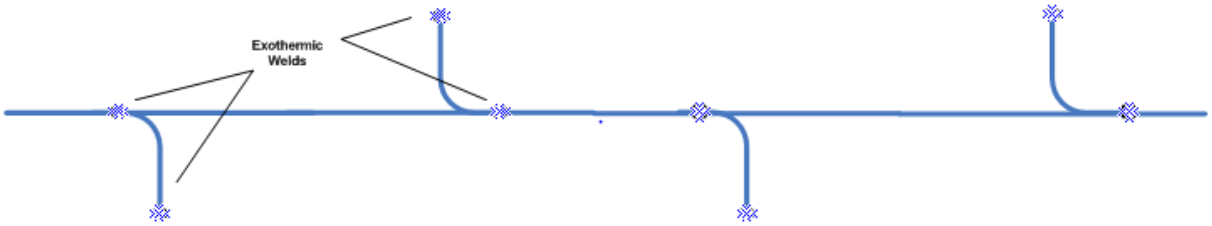


FIGURE 5.11.2-1. Grounding of cable guard wire. Note the alternating direction of the sweeps of the jumper wires. This pattern is required for the proper protection of the power cable.

For difficult excavations, such as rock formations or permafrost, the ground rods may be driven 3 feet on either side of the trench.

Where multiple conduits enter manholes, the following schemes illustrate guard wire grounding methods (all sharp corners to be rounded out) (Figure 5.11.2-2).

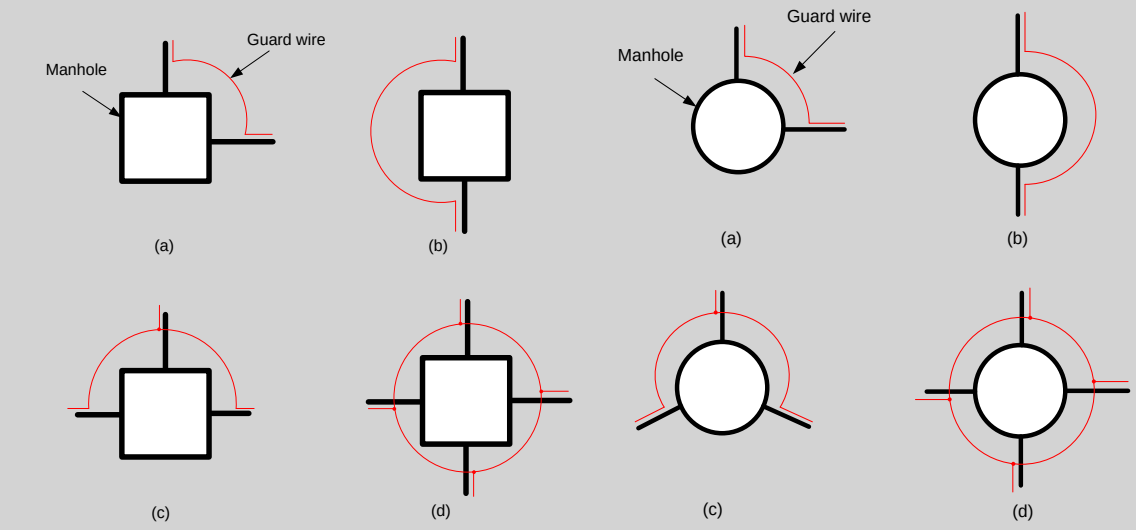


FIGURE 5.11.2-2. Guard wire grounding schemes.

5.11.3 Medium voltage manholes and hand holes

Power and control cables shall be installed in separate manholes and hand holes.

Until ready for acceptance testing, no installation work shall involve energized systems. Install power cables, ground wires, grounding loops, and manhole racks and furniture in such a way as to give maximum safe clearance space for personnel to enter the manhole when conducting subsequent operation and maintenance tasks. Conductors shall be placed well out of the way of human ingress/egress pathways through the manhole or vault. Bonding jumper wires shall be routed in such a manner that through-air clearance between adjacent conductors, and between conductors and any metallic or grounded surface, is maintained. During acceptance inspection,

manhole installation configurations that are found to be untidy and/or lacking in clearance for later maintenance tasks shall be required to be redone at the contractor's expense.

If space is available, cable slack sufficient for one splice for each cable shall be left in each manhole. Elimination or shortening of slack lengths shall require authorization by the FAA.

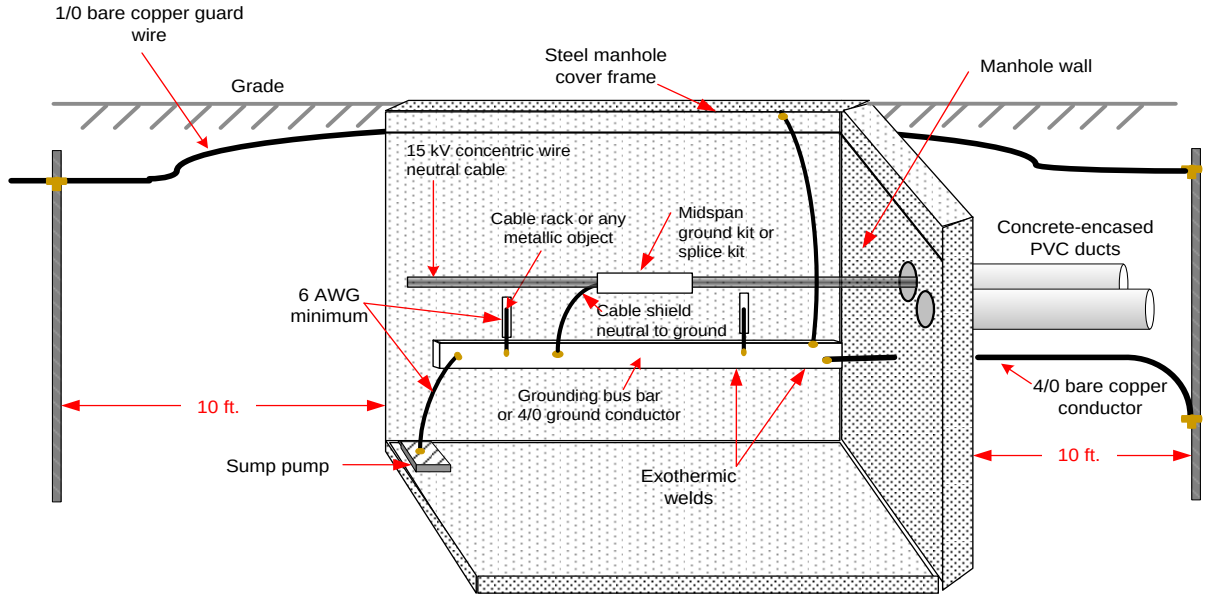
All new and existing cable in manholes shall be secured to nonmetallic racks on the manhole walls. Cables shall be secured to racks or mounted on a heavy duty nonmetallic multi-mount cable support arm.

Physical dimensions of manholes may be altered to fit requirements. The following procedure covers the minimum grounding requirements (Fig. 5.11.3-1 and 5.11.3-2):

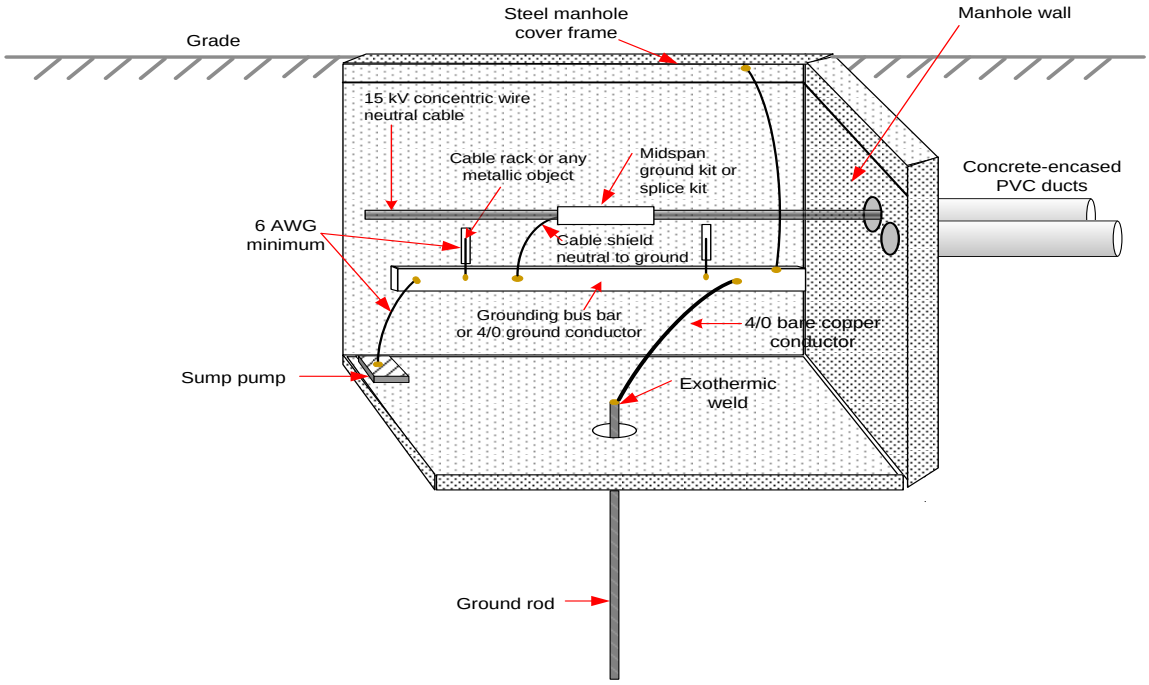
a. Where 15 kV cables enter a manhole, install a solid bare copper bus bar inside the manhole, or alternatively, run a 4/0 bare stranded copper grounding conductor, creating a grounding surface about 12 in. above the finished floor. Arrange bus bar or conductor so as to avoid interference with duct entrances into the manhole or with other cables. Make this conductor of sufficient length to facilitate repair and future installation operations. If the duct run contains a guard wire, connect the bus bar or 4/0 conductor to a ground rod outside of the manhole. Otherwise, connect the bus bar or 4/0 conductor to a ground rod inside the manhole.
b. Where installed, connect and exothermically weld the 1/0 AWG guard wires to the outside ground rods on each side of the manhole, ensuring 10 ft distance from the outside of the manhole to the ground rod.
c. If feasible, all connections, sweeps, or curves in the grounding system shall be smooth and shall be of at least 8 in. radius no matter what the orientation (vertical or horizontal).
d. Where new 15kV cables are installed and an existing grounding system is not present, bond the manhole cover frame, cable rack inserts, and other metal within the manhole with minimum #6 AWG bare copper conductors. Secure the #6 AWG conductors to the manhole walls as necessary to prevent interference with other cable routing. For the bus bar, use two-hole lugs to make the connections. If using a 4/0 ground conductor, wherever possible make connections using the exothermic process; otherwise use UL-listed grounding connectors.
e. Ground 15 kV concentric neutral cable in a manhole, but not more frequently than every 1,300 ft along the duct run (i.e., if manholes are spaced 600 ft apart, then the cable may be grounded in every other manhole). Two methods of grounding the neutral conductor or steel interlocked armor (if used) are permitted:
    a. Neutral mid-span grounding kit sized for the application. Remove the cable jacket to expose the concentric neutral conductors. Carefully follow the grounding kit manufacturer's instructions so as to cut only deep enough to remove the cable jacket to make this connection. The cable neutral grounding braid or the extended length #2 AWG concentric neutral shall be coupled together with a UL-listed grounding connector to a #2 AWG conductor, extended and exothermically welded to the #4/0 grounding conductor, or, if using a bus bar, mechanically terminated using two-hole lugs at the bus bar.
    b. Splices. Splices shall be of the cold shrink jacket seal type. All splices inside a manhole shall be solidly grounded, with jumper wires running across the joints to connect the cable shields. At the splice, when not using a mid-span grounding kit, ground the cable

neutral conductor to the bus bar. The cable neutral grounding braid or the extended length #2 AWG concentric neutral shall be coupled together with a UL-listed grounding connector to a #2 AWG conductor, extended and exothermically welded to the #4/0 grounding conductor, or, if using a bus bar, mechanically terminated using two-hole lugs at the bus bar.

f. Hand holes follow the same basic principles as above, with appropriate modifications.



(a)



(b)

FIGURE 5.11.3-1. Grounding and guard wire installation detail for (a) manhole having a guard wire, and (b) manhole lacking a guard wire.

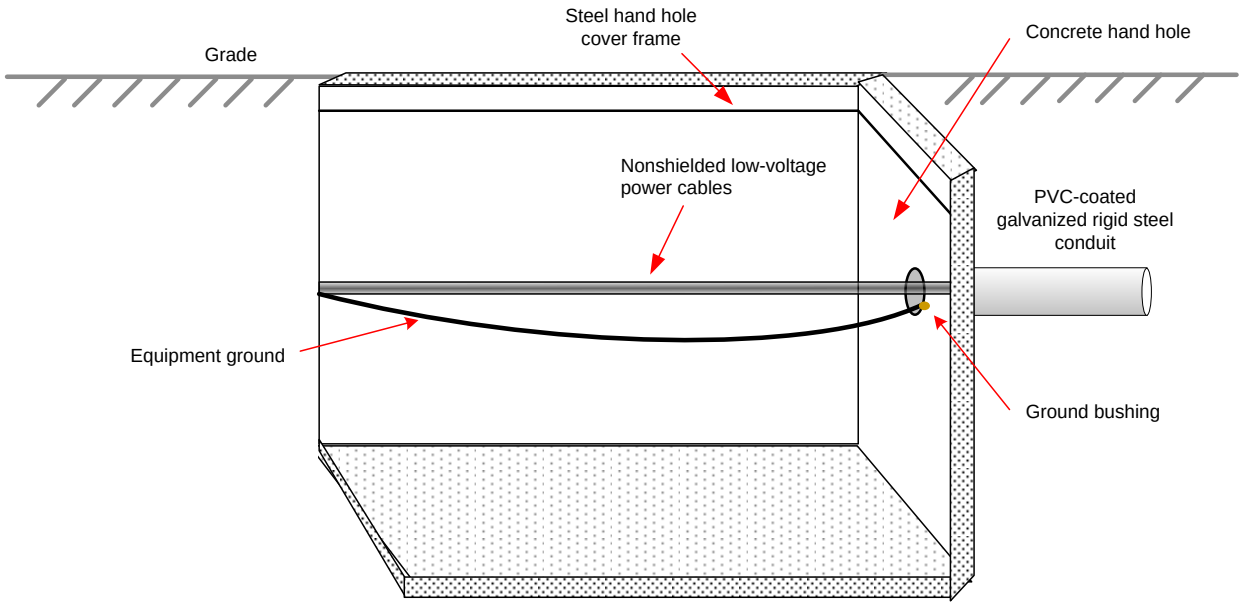


FIGURE 5.11.3-2. Hand hole grounding installation detail.

5.11.4 Equipment and equipment enclosures

Ground ELD equipment and equipment enclosures in accordance with NESC ANSI C2 Section 38, Rule 384 (for medium voltage equipment) and FAA-STD-019 (for low voltage equipment).

Pad-mounted transformers and other pad-mounted equipment—At a minimum, install a single ground rod. A 4/0 AWG ground conductor shall extend from the ground rod into the equipment compartment. Bond the transformer equipment frame and other non-current-carrying metal parts, such as cable shields, cable sheaths and armor, metallic conduit, and other non-current-carrying metal parts to the 4/0 AWG ground conductor above ground using mechanical connectors. Ground the secondary neutral.

Power distribution racks—Install a counterpoise at a distance of 2’ to 6’ from power distribution racks, and at a depth specified in the latest version of FAA-STD-019. Counterpoise shall consist of bare 4/0 AWG copper conductors and two driven ground rods around the rack. Ground the power distribution rack and equipment and other non-current-carrying metal parts to the counterpoise using exothermic welds. If power distribution rack is within 15 feet of a shelter having an existing FAA NAS earth electrode system (EES), a connection between both counterpoises shall be made.

Connect metallic conduits that terminate to the enclosure by grounding all bushings and the grounding conductor to the equipment ground bus.

Route cables within switchgear and enclosures in a manner which will allow room for bending and terminating of cables. Cable training bend radius shall be at least 12 times cable diameter.

5.11.5 Surge arresters

Follow detail drawings in the drawing set for surge arrester grounding. For ungrounded and single-grounded systems, modify the requirement in accordance with IEEE C2 and UFC 3-550-03FA.

Bond surge arresters and neutrals directly to the grounding electrode system. Keep lead lengths as short as possible with no kinks or sharp bends.

5.11.6 Conduit and fittings

Conduit joints and fittings shall be electrically continuous between joined parts. Ferrous conduit enclosing power conductors to FAA facilities shall be terminated using conductive fittings to their respective junction boxes, equipment cabinets, enclosures, or other grounded metal structures.

5.11.7 Low-voltage cable runs to facility service entrances

The ELD low-voltage (≤ 600 V) cable runs coming from a commercial utility power meter and feeding power to FAA facility service entrances are considered to be FAA owned and operated utility distribution systems and shall follow the grounding and safety requirements of IEEE C2/NESC. Wiring after the distribution service delivery point (usually at the terminals of the service equipment but always as close to the FAA facility as possible) is generally considered premises wiring and shall follow NEC/NFPA 70 Section 250, *Alternating Current Systems between 50 V and 1000 V.*

For the grounding requirements of service laterals, consult the grounding section of this specification.

In the FAA's ELD systems, there are gray areas in determining which electrical safety and grounding codes apply in a given situation or portion of the system (NESC or NEC); consult the office of primary interest to determine whether a segment is distribution or premises wiring.

5.11.8 ELD system grounding

5.11.8.1 Installation of power distribution rack earth electrode system (EES)

To meet site grounding requirements, install equipment counterpoise and EES according to the design drawings to ensure that the desired grounding values are achieved at all points of the ELD system.

Equipment distribution rack EES – Where not on or within 15 feet of an FAA NAS earth electrode system, install bare 4/0 AWG copper conductors in a loop not less than 12 inches (12") below finished top of soil grade. Connect the 4/0 AWG copper conductor to the ground rod with an exothermic weld.

Ground rods - Drive cone-pointed ground rods to full depth plus another 12 inches below grade. Ensure that the installation provides an earth ground of the appropriate value for the particular equipment being grounded. Neatly and firmly attach and exothermically weld two ground rods to the 4/0 AWG loop and keep the amount of exposed bare wire to a minimum.

5.11.8.2 Grounding and bonding connections
When feasible, where grounding connections are buried or otherwise normally inaccessible and/or uninspectable, use exothermic welds. Make exothermic welds strictly in accordance with the weld manufacturer's written recommendations. Welds that are "puffed up" or that show convex surfaces indicating improper cleaning are not acceptable. No mechanical connections shall be made below grade.

Mechanical connections above grade shall employ bolted solderless connectors, in compliance with UL 467.

5.11.8.3 Routing grounding and bonding conductors
Connect and bond transformer enclosures and equipment frames to the grounding counterpoise system. Size grounding and bonding conductors in accordance with the drawings. Bends less than 90 degrees are not permitted. Avoid routing ground conductors through concrete. When concrete penetration is necessary, cast nonmetallic conduit flush with the points of concrete entrance and exit so as to provide an opening for the ground conductor. Seal the opening with a sealing compound after installation.

5.11.8.4 Grounding cable across expansion joints
For grounding cables that cross expansion joints or similar separations in structures and pavements, use approved devices or methods of installation to provide the necessary slack in the cable across the joint to permit movement. Use stranded or other approved flexible copper cable across such separations.

5.11.8.5 Grounding of armored cable and metallic conduit
Apply the following requirement during initial cable installation. For medium voltage systems, bond cable armor and/or metallic conduit to the earth electrode grounding systems of the connected equipment at both ends with a 2 AWG conductor, including at splices in manholes and hand holes. An armored bonding jumper shall be installed across each splice. For low voltage systems, bond the cable armor to the ground bus of the service disconnecting means at the electrical service entry point. Bonds shall be electrically continuous between joined parts (see FAA-STD-019).

5.11.8.6 Grounding Riser poles
Directly connect equipment, neutrals, surge arresters, and items required to be grounded to the single continuous vertical ground rod conductor (No. 2 AWG minimum) on each riser pole. Ensure that ground rod conductors are stapled to wood poles at intervals not exceeding 2 feet.

5.12 Cable tagging, equipment markers and labels, and safety signs

5.12.1 Cable tags

Individual cables or groups of the same type of cable shall be clearly and unambiguously identified in accessible locations such as manholes, hand holes, junction boxes, and pull boxes by means of a minimum of two tags per cable, one near each duct entrance hole. Unless otherwise specified in the contract documents, cable tags shall be constructed of metal, or of rigid laminated plastic of at least 1/16" total thickness.

Plastic tags shall be exterior classified and consist of two plies: a plastic base and a 0.005" surface of impact acrylic plastic for front engraving. The tag shall be ultraviolet (UV) light stable. Engraving shall be black background and white letters. Tags shall be attached to the both terminated ends of the cable with two UV-rated nylon or stainless steel cable ties.

Cable terminations and potheads shall be tagged as to function, including facility which they serve, and any pertinent data (e.g., voltage, source, destination). Tags shall be marked with an abbreviation of the name of the facility or facilities served by the cable plus the letter "P" (Power). Where more than one identical cable is used to serve the same facility, cables may be bundled under one tag unless job plans state otherwise.

5.12.2 Equipment markers and labels

Design and select ELD equipment markers and labels for exterior use in accordance with this specification.

> **Exception:** When labeling wires and cables in ELD above-ground, enclosed applications (e.g., equipment racks), follow FAA-C-1217, *Electrical Work, Premises Wiring*.

5.12.2.1 Exterior equipment identification tags, labels, and plaques

Aluminum tags, or any other tags or labels approved by the project engineer, shall be labeled to identify ELD equipment. Attachment options include wires and ties, or screw mounts, nails, or bolts. Contrasting colors shall be considered when ordering tags and labels. Plaques may be made of laminated plastic.

5.12.2.2 Warning and safety signs and labels

To minimize accidents, manufacturers of electrical products use ANSI Z535, *Safety Alerting Standards,* to make their products and manuals safer. Contractors shall ensure that colors, safety signs and labels, safety symbols, barricade tapes, and information on product manuals, instructions, and collateral materials applying to FAA ELD equipment meet ANSI Z535.1 thru .6 standards.

5.12.2.3 Arc flash hazard labeling

In instances where an arc flash analysis has been completed and updated with any as-built changes, the results of the study shall be labeled on all corresponding equipment, as well as the

drawings. Follow NEC Article 110.16 for guidance on warning labels.

Electrical equipment shall be field marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before installation of the equipment.

Following the completion of arc flash hazard and shock analyses, the electrical equipment evaluated shall be labeled to include the findings of the analyses. At a minimum, the label shall include the following information: flash hazard boundary; incident energy (calories/cm^2) at appropriate working distances; or personal protective equipment (PPE) level - including what fire-retardant clothing is required; shock hazard level (kV); limited approach boundary (feet/inches); restricted approach boundary (feet/inches); class of voltage-rated gloves for highest voltage present; equipment name; and date of survey.

5.13 Cable markers

5.13.1 Concrete markers for DEB cable

Concrete markers are required only for direct earth buried (DEB) cables. Install a concrete slab marker at each change of direction of DEB cable, over the ends of ducts or conduits which are installed under paved areas and roadways, and over each splice. Markers shall be two feet (2') square and six inches (6") thick. The markers shall be installed flat in the ground with the top approximately one inch (1") above the finished grade. Install slabs so that the side nearest the inscription on top includes an arrow indicating the side nearest the cable. Provide color, type, and depth of warning tape.

Concrete shall have a compressive strength of not less than 277 MPa (4,000 psi) and have a smooth, troweled finish on the exposed surface. After the concrete marker has set a minimum of 24 hours, the top surface shall be painted bright red with paint manufactured specifically for uncured exterior concrete. Markers shall not be installed in concrete or asphalt surfaces.

Each cable marker shall have the following information impressed upon its top surface:

a. The word "CABLE".

b. Name of facility served; for example, "ASR," "VORTAC," "ALS," etc.

c. The designation of the type of cables installed shall be shown on the marker. The type shall be marked with the following abbreviations: "P" for Power, "C" for Control, "T" for Telephone, and "R" for Coaxial (Radio Frequency).

d. An arrow to indicate the direction or change of direction of the cable run.

e. Any additional information as defined by the contract drawings.

f. The contractor shall obtain authorization from the FAA for the information to be impressed on the cable marker and for the method of impression. The letters shall

be four inches (4”) high, three inches (3”) wide and one half inch (1/2”) deep.

The location of the ends of ducts shall be marked with concrete markers 2 feet (2’) square and 6 inches (6”) thick. The duct markers are to be installed in the same manner as cable markers, except the following shall be impressed upon their top surface:

a. The word, "DUCT".

b. Name of facility served; for example, “ASR," “VORTAC,” “ALS,” etc.

c. An arrow to indicate the direction or the change in direction of the cable route.

d. The number of conduits and the type of conduits: for example, 4-P/2-C.

e. Any additional information as directed by the FAA project engineer.

DEB cables shall be marked every two hundred feet (200’) along a cable run, at each change of direction of the cable, and at each cable splice.

The markers used for DEB cables shall be impressed with a “P” for power cable.

Information: American Public Works Association (APWA) color codes for underground utilities are shown in Table VI.

TABLE VI. APWA color codes.

COLOR CODE	TYPE OF UNDERGROUND UTILITY
RED	Electric power lines, cables or conduits, and lighting cables
YELLOW	Gas, oil, steam, petroleum or other hazardous liquid or gaseous materials
ORANGE	Communications, cable TV, alarm or signal lines, cables, or conduits
BLUE	Potable water lines
GREEN	Sewers, storm sewer facilities and utilities, or their drains lines
PURPLE	Reclaimed water, irrigation, or slurry lines
WHITE	Proposed excavation
PINK	Temporary survey marking

5.14 Acceptance and inspection procedures

After the installation of power cable systems is completed, the FAA and/or its contractor shall perform acceptance/commissioning testing (refer to Appendix C). All safety procedures for energizing the systems following installation shall follow OSHA confined spaces regulations and NFPA 70E. Tests shall be conducted in the operational environment to confirm operational readiness of the ELD and to identify safety hazards involving any component of the ELD system that will support a system in the NAS.

If applicable, participants shall include the FAA project manager, project engineer(s), contract technical representatives, environmental, safety, real estate, power company contracts representative, airport authority representative, and airport staff.

Once acceptance tests are completed and the results accepted, the FAA shall take beneficial occupancy of the ELD system. This may occur in stages.

6. INSTALLATION OF SYSTEM CABLES

System cables consist of power cables that leave a facility to provide power to a light lane, such as an ALSF, MALSR, ODALs, etc. This specification does not cover associated system equipment such as light housing assemblies (LHA), electronics, etc. Consult with the applicable office of primary for installation of those systems. See Appendix G for details of FAA's various lighted navaids cable systems.

Install all system cables in Schedule 80 conduit and follow the burial depth requirements provided in this specification for ELD system cables.

6.1 MALSR/MALSF/MALS System Cables

6.1.1 Power Cables Running from a Shelter to the Distribution Panel

Install power cables from the MALS shelter to the distribution panel using Schedule 80 PVC conduit. Install cables from the distribution panel through Schedule 80 PVC conduit. These cables shall be installed through hand holes inline and beside each light bar station in the MALS system. If a MALS has a threshold, a separate PVC conduit system shall be installed directly from the distribution panel to the threshold disconnect switch. Follow the specification for ELD hand holes herein for providing and installing system cable hand holes.

6.1.2 Flasher Power Cables

From the MALSR/F shelter, the flasher power cables shall run through its own Schedule 80 conduit system and terminate in a hand hole at the first flasher. This cable shall continue through Schedule 80 conduit to all remaining flashers. A hand hole shall be installed at each flasher station.

6.1.3 Flasher Control Cables

From the MALSR/F shelter, the flasher control cable shall run through its own Schedule 80 conduit system and terminate in a hand hole at the first flasher. This cable shall continue through Schedule 80 conduit to all remaining flashers. It is permissible to run the flasher control cable through the same hand holes as the MALSR/F flasher power cables. These two systems operate at the same voltage and present no inherent danger from the power cable voltages.

6.2 ALSF System Cables

ALSF power cables for the steady burning lights shall run from the facility to each loop through its own Schedule 80 PVC conduit system. A hand hole shall be installed at the first termination

point of the loop, and another at the last termination point of the loop as it returns to the facility. In addition, a Schedule 80 PVC conduit system shall interconnect each light station in each loop.

6.2.1 Flasher Power Cables

From the ASLF facility, the flasher power cables shall run through its own Schedule 80 conduit system, pass through a hand hole at the first flasher station, and terminate in the first flasher junction box terminal block. From the terminal block, a cable to the next flasher station shall continue through Schedule 80 conduit via hand holes located at each flasher. This configuration shall continue to all flashers. A hand hole shall be installed at each flasher station to allow the cable to pass through and terminate in each junction box located at each flasher station.

6.2.2 Flasher Control Cables

From the ALSF facility, the flasher control cable shall run through its own Schedule 80 conduit system and terminate in a hand hole at the first flasher. This cable shall continue through Schedule 80 conduit to all remaining flashers. It is permissible to run the flasher control cable through the same hand holes as the ALSF flasher power cables. These two systems operate at the same voltage and present no inherent danger from the power cable voltages.

APPENDIX A—Surge Arrester Performance Data

1. SCOPE

This appendix provides surge arrester performance data for FAA medium-voltage (MV) electrical line distribution (ELD) systems. Surge arresters protect the following ELD system elements:

a. Overhead lines and distribution transformers (utility responsibility),
b. MV transformers and cable installations,
c. MV cables,
d. Internal switchgear and sectionalizing switchgear in MV networks,
e. Other ELD-related special-purpose applications as required.

2. APPLICABLE DOCUMENTS

2.1 Non-government publications

Institute of Electrical and Electronics Engineers (IEEE)

IEEE C62.11 (2005; And 1 2008)
Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits (>1kV)

Guide Information for Electrical Equipment, The White Book 2011, and UL Product Categories Correlated to the 2008 and 2011 National Electrical Code®. Surge Arresters 1000 Volts and Higher (VZQK)

National Electrical Manufacturers Association (NEMA)

NEMA LA 1 (1992; R 1999) Standard for Surge Arresters

National Fire Protection Association (NFPA)

NFPA 70 (2008; TIA 08-1) National Electrical Code

NEC article 280: Introduces surge arresters, general requirements, installation requirements, and connection requirements.

3. REQUIREMENTS

3.1 Performance Requirements

3.1.1 General

The requirement is for high-quality metal-oxide surge arresters for use in FAA-owned distribution networks to ensure the protection of underground power cables, low-level distribution transformers, generators, sectionalizing switches, and other electrical equipment. Surge arresters limit dangerous voltage surges caused by lightning strikes or switching anomalies occurring in the ELD network. Arresters also increase the availability of power by reducing outages. Voltage surges can result in personnel injuries from electrical shock, insulation damage to equipment, and possibly fire. Surge arresters provide safe dissipation of these surges.

The standard root-mean-square (rms) maximum continuous operating voltage (MCOV) and rms duty-cycle voltage ratings for typical nominal voltage values and configurations used in FAA underground electrical distribution systems (except note 1) are shown in the table below. Light-duty surge arresters in common use in FAA ELD systems correspond to these configurations.

Nominal Voltage (KVrms)	MCOV (KVrms)	Duty-Cycle (KVrms)
4,160Y (3φ) 2,400 (1φ)	5.1 KV 2.55 kV	6 KV 3 kV
13,200Y(3φ) 7,620 (1φ)	15.3 KV 7.65 kV	18 KV 9 kV
4,160Δ (3φ)(see note 1)	5.1	6 kV
13,800	15.3 kV	18 kV

Note (1): The delta configuration is not a typical FAA ELD configuration. If you encounter this configuration or any configuration not shown above, call the Power Cable Program Office, AJW-22, for guidance.

3.1.2 Placement

Medium voltage surge arresters shall be provided on the line side of:

1. Pole-mounted transformers (utility responsibility in most cases),

2. Overhead to underground terminal poles (utility responsibility),

3. All “normally open” switchways of pad-mounted sectionalizing switches connected to and served from overhead lines,

4. Underground primary metering installations connected to and served from overhead lines (utility company responsibility),

5. On the line side of any location where a voltage/facility transition occurs, e.g., at a facility pad-mounted transformer.

3.1.3 IEEE Standard C62.11

The design, fabrication, testing, and performance requirement to which a medium voltage surge arrester shall comply is IEEE C62.11 (reference provided above). The definition provided in IEEE C62.11 for metal-oxide surge arresters for ac power circuits greater than 1 kV is:

> **Arrester, distribution, light duty class:** An arrester normally installed on and used to protect underground distribution systems where the major portion of the lightning stroke current is discharged by an arrester located at the overhead line/cable junction.

This class of surge arrester conforms to the minimum recommended level to provide protection against switching and other transient voltages in the underground ELD infrastructure. Light duty class arresters are constrained by the prescribed test requirements of standard IEEE C62.11 (see table below).

Surge arrester test requirements

Class	Rated voltage (kV)		Lightning impulse classifying current (kA)	Minimum High current Short duration withstand (kA)	Minimum Low current Long duration withstand (A, μs)
	Duty cycle	MCOV			
Distribution, light duty	3–36	2.55–29	5	40	75, 2000

3.1.4 Service conditions

An arrester installed in the FAA ELD system shall be capable of successful operations under the service conditions given in the paragraphs below.

3.1.4.1 Usual service conditions

Physical conditions

a) Ambient air temperature in the general vicinity of the arrester shall be between –40°C and +40°C except that: (1) Ambient air temperature in the general vicinity of dead front arresters shall be between –40 °C and +65 °C, and (2) Ambient liquid temperature in the general vicinity of liquid-immersed arresters shall be between –40°C and +95°C.
b) Maximum temperature of the arrester, due to external heat sources in the general vicinity of the arrester, shall not exceed 60°C, except that (1) Maximum temperature of the dead front arrester shall not exceed 85°C, and (2) Maximum temperature of the liquid-immersed arresters shall not exceed 120°C.
c) Altitude shall not exceed 1800 m (6,000 ft), except for liquid-immersed arresters.

System conditions

a) Nominal power system frequency of 48 Hz to 62 Hz.
b) System line-to-ground voltage within the ratings of the arrester under all system operating conditions.

3.1.4.2 Unusual service conditions. Exposure to any of the service conditions described in the sections below may require special consideration in the design or application of arresters.

Physical conditions

a) Ambient temperatures in the general vicinity of the arrester exceeding the values given in Section 3.1.4.1 above, Physical Conditions.
b) Maximum arrester temperatures exceeding the values given in Section 3.1.4.1 above, Physical Conditions.
c) Altitude exceeding 1800 m (6,000 ft). Arresters for service at higher altitudes shall be suitable for operation at either of the following altitude ranges:
   i) 1801–3600 m (6,001–12,000 ft).
   ii) 3601–5400 m (12,001–18,000 ft).
d) Exposure to any of the following:
   i) Damaging fumes or vapors
   ii) Excessive dirt, salt spray, or other current-conducting deposits.
   iii) Steam.
   iv) Explosive atmospheres, abnormal vibrations, or shocks
e) Limitation on clearances to nearby conducting objects, particularly at altitudes exceeding 1800 m (6,000 ft)
f) Unusual transportation or storage.

System conditions

a) Nominal power frequency other than 48 Hz to 62 Hz
b) System operating conditions whereby the ratings of the arrester may be temporarily exceeded. Some examples are as follows:
   i) Loss of neutral ground on normally grounded circuit
   ii) Generator overspeed
   iii) Resonance during faults upon loss of major generation
   iv) System instability
   v) Persistent single line-to-ground fault on ungrounded three-phase systems
c) Any other unusual conditions known to the user.

APPENDIX B—Cable Pulling Calculations

This appendix provides basic information on how to calculate maximum pull force during cable pull operations. It is provided for information purposes only. For detailed information and more elaborate tables, consult the cable manufacturer. Industry software is readily available to assist with these calculations.

1. To calculate cable pulling force for a cable consisting of several segments, and/or where a cable bends around a curve or a number of curves, calculations are done in incremental segments/steps using formulas and tables, with the segments/steps added together to arrive at the cumulative maximum pull tension. Add an additional 15% margin for safety. To illustrate the cumulative method, an example is given: the pull force calculated for a cable segment A is added to a "bend multiplier" AB, a pull force for straight cable segment B, a pull force for cable segment C, a bend multiplier CD, and a cable segment D, etc., plus 15%.

The basic formula for calculating maximum pulling tension in a single cable section is:

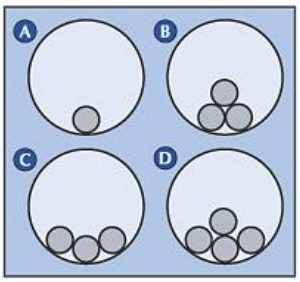
$T = L \times w \times f \times W,$

where
T is the total pulling tension (lb),
L is the length (ft) of cable being pulled,
w is the total weight (lb/ft) of the conductors,
f is the coefficient of friction (usually 0.5 for well-lubricated conditions),
W is the weight correction factor.

2. The process for calculating pull force for a segment of a cable run is as follows:

a. Enter the length of the cable segment in the formula above.
b. Enter the weight of the cable segment.
c. Enter the coefficient of friction.
d. Enter the weight correction factor W, derived as follows:
   i. Determine the geometric position of how the cables will lay in the conduit.
   ii. Calculate W using the table below.
e. Check for jamming hazard of the cables in the conduit.
f. Check sidewall bearing pressure (SWBP).
g. Check headroom.

3. The weight correction factor (W) calculation is based on the cable geometry in the duct:



A = Single; B = Triangular; C = Cradled; D = Diamond

To determine cable geometry, use the ratio of the conduit's inside diameter (D) to the cable's outside diameter (d) to find how the single conductors will sit in the conduit:

Triangular (Fig. B): This occurs when pulling three individual conductors from three separate reels, and their D/d ratio is less than 2.5. If pulling individual triplexed conductors from a single reel, the cables will also sit in this position.

Cradle (Fig. C): This position may occur when pulling three individual conductors from three separate reels, and their D/d ratio is between 2.5 and 3.0. This position is the least favorable because it yields the worst-case scenario of drag during the pull.

Diamond (Fig. D): This position occurs when pulling four individual conductors from four separate reels, and their D/d ratio is less than 3.0. If pulling quadruplexed individual conductors from a single reel, the multiconductor cable will also sit in this position.

No. of Conductors	**Position**	**Weight Factor Equation**
1	Single	$W = 1$
3	Triangular	$W = 1 / \{1-[d/(D-d)]^2\}^{1/2}$
3	Cradled	$W = 1 + \{(4/3) \times [d/(D-d)]^2\}$
4	Diamond	$W = 1 + \{2 \times [d/(D-d)]^2\}$
W = Weight correction factor D = Inside diameter of conduit d = Outside diameter of individual conductor		

For the most conservative calculation, use the cradle configuration.

4. Jamming ratio. When sizing the conduit system, installers must consider the possibility of cables jamming or wedging. This usually occurs when three or more individual conductors lie side by side in a single plane. As the conductors are pulled through a bend, the curvature of the bend tends to squeeze the conductors together. Use the following formula to determine the likelihood of jamming. Use the inside diameter of the conduit and the outside diameter of the individual conductor. Avoid jam ratios of 2.8 to 3.2 for Type MV extruded dielectric power cables:

$1.05 \times (D \div d)$

Where
D = the inside diameter of the conduit
d = the outside diameter of an individual conductor.
Constant factor 1.05 = correction for oval shape of bends in the sectional view.

- If the value is less than 2.5, the cable will jam,
- If the value is less than 3.0 but greater than 2.8, jamming is very possible,
- If the value is greater than 3.0, jamming will not occur.
- For medium-voltage extruded dielectric power cables, avoid values between 2.8 to 3.2.

5. Sidewall bearing pressure (SWBP). Sidewall bearing pressure (in pounds per foot) is the tension on the cable coming out of a bend (in pounds) divided by the inside radius of the bend (in feet). When pulling at a bend, the recommended maximum sidewall pressures for 15kV class and less is 500 lb/ft (or less, if recommended by the manufacturer).

No. of Conductors	**Position**	**SWBP Equation**
1	Single	SWBP = T ÷ R
3	Cradled	SWBP = [(3W – 2) x T] ÷ 3R
3	Triangular	SWBP = (W x T) ÷ 2R
4	Diamond	SWBP = (W – 1) x (T ÷ R)
W = weight correction factor; T = calculated tension; R = radius of bend (inside radius).		

6. Headroom. To ensure a safe and easy pull, provide clearance between the uppermost conductor and the top of the conduit. For straight pulls, a clearance as small as ¼ in. is considered safe. For more complex pulls, between ½ in. and 1 in. is required. Use the equations below to derive the clearance for a given conduit and cable sitting position. Note that allowance is made for variations in cable and conduit diameters, and the oval shape of the raceway sections at bends.

Configuration	**Clearance**
Single	$C = D' - d'$
Triangular	$C = \left[\sqrt{D' - 1.3366}\ d' + \sqrt{(D' - d')}\ \right] \times \sqrt{[1 - (d' \div D' - d)^2]}$
Diamond	$C = \left[(D' - d') - 2d'^2\right] \div (D' - d')$
C = Clearance, D´ = 1.05 x nominal conduit inside diameter; d´ = 1.05 x nominal overall diameter of individual conductor.	

7. Limit pulling tension to 0.008 lb/cmil for copper conductors pulled by pulling eyes or pulling bolts (pulling tension applied directly to the conductor).

8. Limit pulling tension to 1,000 lb for jacketed cables pulled by cable grips.

9. Angle of bend. Every time there is a bend in the cable, a bend multiplier factor must be introduced:

Bend Angle	Multiplier
15	1.14
30	1.30
45	1.48
60	1.70
75	1.94
90	2.20
105	2.50
120	2.86

10. For steel, wire, rope, or tape used for cable pulling, a tensiometer or dynamometer graduated to indicate the tension on the cable being pulled can be used, or the contractor shall adapt a rope harness properly sized to limit pull tension to the value indicated. Any combination of a group of cables to be pulled into a duct shall not exceed the sum of individual allowable tension of each cable plus 15 percent.

APPENDIX C—Acceptance testing of newly installed FAA medium voltage underground power cables

This appendix specifies *acceptance testing* of newly installed FAA insulated underground medium voltage power cables rated 2 kV to 15 kV, shielded, non-shielded, and armored. It does not cover *installation testing* or *maintenance testing* as defined in IEEE 400.2. Nor does it cover testing of older, in-service cables. For comprehensive treatment of the maintenance testing of FAA power cables, refer to FAA Order 6950.22, *Maintenance of Electrical Power Cables*.

The testing guidance below applies to both direct burial cables and cables installed in nonmetallic and metal conduit. This appendix covers four types of tests used for validating acceptance of FAA medium voltage cables and accessories: (1) a continuity test, (2) an insulation resistance test; (3) an AC VLF field test; and (4) an offline 50/60 Hz partial discharge test. At a minimum, tests one through three (continuity, insulation resistance, and VLF withstand tests) shall be employed as acceptance tests of new FAA cable installations. Test four (offline PD test) is a state-of-the art test that provides the most thorough and exacting test data of all the choices. It can be substituted for the VLF withstand test if funding is available. The test must be conducted by a qualified third-party testing firm that is preapproved by the FAA, and requires extra lead time in planning the test activity (3 months).

Any newly installed cable that fails as a result of cable acceptance testing shall be replaced by the installation contractor at the installation contractor’s expense.

The paragraphs that follow detail each test’s theory of operation, parameters and tolerances, test schedules, and safety and test procedures. If any conflicts arise relating to power cable testing parameters, procedures, or safety as presented in this appendix, the guidance of FAA Order 6950.22 shall take precedence.

SAFETY REQUIREMENTS, GENERAL

The following are general safety requirements for all electrical power cable acceptance tests. Safety requirements particular to each test are provided in the tests’ respective sections that follow.

Before testing is performed, ensure that cables and associated terminations are isolated from electrical apparatus such as power transformers, potential transformers, surge arresters, capacitors, etc. Cables are allowed to be connected to switches and fused cutouts as long as the switch isolates the cable and terminations from electrical apparatus mentioned above. Maintain at least a 6-inch clearance between cable ends and any grounded surface. If modular "load break" elbow terminations are used on the cable, ensure that the load break elbows are inserted in the associated isolated parking bushings.

Ensure that all cables and terminations are disconnected and isolated from all sources of power. Using proper high-voltage test instruments, verify that the conductors are not energized and there is no back-feed from some unknown source.

Ensure that all cable shields, equipment grounding conductors, armor, and metallic conduits are properly grounded to the earth electrode system at both ends of the cable to be tested. If present, check to ensure that the cable shield, armor, and equipment grounding conductors are electrically continuous from one end of the cable to the other.

Refer to FAA Order 6950.22, Chapters 1 (Para. 105), 2 (Para. 220, 221, 222), and 5 (Para. 504), as well as applicable IEEE standards for more safety guidance.

1. INSULATION RESISTANCE TEST

1.1 Theory of Operation

After cable system installation and before the cable system is placed in normal service, a "limited voltage" DC insulation resistance test shall be performed and documented, including the testing of terminations and joints.

The insulation resistance test is classified by the IEEE as a diagnostic test. The purpose of the test is not to ensure the cable systems' future performance but simply to assure the construction team that the line is not grounded/shorted before energization. Insulation or dielectric resistance is the resistance to the flow of direct current through or over the surface of the insulating material. Cables are tested by measuring the resistance between conductors, and the resistance between each conductor and ground. For a new cable, or one that is believed to be in very good condition, all of these resistances should measure in megohms (for tolerances, see Section 1.2 of this appendix below).

Any insulation resistance values less than 50 megohms shall be investigated. Note that the insulation resistance values may be affected by temperature, cable geometry, cable length, and leakage along cable terminations.

The installation contractor shall be responsible for repair/replacement of any failed components and retest costs.

1.2 Parameters and Tolerance limits

For test parameters and tolerance limits, refer to FAA Order 6950.22, *Maintenance of Electrical Power Cables,* Chapter 3, *Standards and Tolerances,* Paragraph 301, Table (see column heading labeled "NEW CABLE").

1.3 Test Schedules

Test after installation and just before energizing the new system.

1.4 Safety and Test Procedure

1.4.1 Safety

Follow safety practices as set forth in Chapter 2 (Para. 221e[2][c]) and 5 (Para. 502, 503) of FAA Order 6950.22, *Maintenance of Electrical Power Cables.* Refer also to the paragraphs that follow, and IEEE standards, for additional safety and grounding procedures.

Before testing begins, ensure that all associated cable shields, armor, equipment grounding conductors, and metallic conduit are properly grounded at both ends to an approved earth grounding systems or electrode. Verify that the conductors are not energized.

Ensure that cable shields and/or armor are electrically continuous by performing a simple resistance measurement using a reliable and calibrated digital multimeter. Ensure that all insulated conductors in the cable assembly that are not to be tested, as well as adjacent cables, are properly grounded at both ends to prevent capacitive voltage build-up.

When testing, one or more cable ends will need to be remote from the testing site. Therefore, before testing is begun, cables ends under test must be cleared and guarded. Switches and fused cutouts and circuit breakers used for isolating the cable under test shall be identified, locked, and tagged out of service. If possible, remote ends of cable being tested should be enclosed in a locked enclosure, vault, room, or other location accessible to qualified personnel only. All testing shall be performed between earth/ground and each insulated conductor, and between each insulated conductor.

Insulation testing must comply with OSHA regulations, Standard for Electrical Safety in the Work Place (NFPA-70E), and the National Electrical Safety Code (ANSI C2). ***All medium/high voltage testing must be performed by TWO individuals.*** Before, during, and after testing, ensure that all applicable safety rules are followed, including the use of proper personal protection equipment (PPE), lockout/tagout of all associated electrical energy sources, testing cables for possible “backfeed” from unknown electrical sources, and discharge of residual capacitive charges on cables to be tested.

Use only the approved high-voltage power test instruments to check for AC and DC voltages on all cables. ***DO NOT use hand-held test instruments which are only rated (or used in electrical/electronic applications) at 1,000 volts or less.***

1.4.2 Test Procedure

Refer to FAA Order 6950.22, Chapter 5, Para. 503 for detailed test procedures. The test procedures cover new cables having either 100% or 133% cable insulation ratings. In instances where the new cable to be tested is joined to an older cable, consult with the FAA project engineer to adjust the testing parameters as needed.

CAUTION: After all tests are complete and before the cables and terminations are placed back into normal operation, ENSURE that all temporary safety grounding connections are removed from all insulated conductors that will be energized.

1.4.2.1 New 2,000 to 5,000 Volt Cables, Terminations, and Joints

Insulation resistance baseline measurements shall be taken and documented after cable system installation, including terminations and joints, but before the cable system is placed in normal service. Test with a 5,000 volt insulation resistance test set (AEMC Instruments Type 5070 or approved equal) applied incrementally up to the voltage rating of the cable for a duration of not to exceed 5 minutes. Do not exceed the rms line-to-ground voltage across the conductor and metallic shield. Record the resistance at each voltage level as well as the ambient temperatures and relative humidity. Perform insulation resistance testing from each insulated conductor to ground and between each insulated conductor (ref FAA Order 6950.22). Because of possible power capacity limitations of the test set, the maximum length of the cable to be tested shall be based on the manufacturer's testing data and the capability of the test equipment. Any insulation resistance values less than 50 megohms shall be investigated. Note that the insulation resistance values may be affected by temperature, cable geometry, cable length, and leakage along cable terminations. Terminations shall be thoroughly cleaned and, if required, a guard circuit shall be used at the termination. The installation contractor shall be responsible for repair/replacement of any failed components and retest costs.

1.4.2.2 New 15,000 Volt Cables, Terminations, and Joints

Insulation resistance baseline measurements shall be taken and documented after cable system installation, including terminations and joints, but before the cable system is placed in normal service. Test with a 5,000 volt insulation resistance test set (AEMC type 5070 or approved equal) applied incrementally up to 5,000 volts for a duration not to exceed 5 minutes. Record the resistance at each voltage level as well as the ambient temperatures and relative humidity. Perform insulation resistance testing from each insulated conductor to ground and between each insulated conductor (ref FAA Order 6950.22). Because of possible power capacity limitations of the test set, the maximum length of the cable to be tested shall be based on the manufacturer's testing data and the capability of the test equipment. Any insulation resistance values less than 50 megohms shall be investigated. Note that the insulation resistance values may be affected by temperature, cable geometry, cable length, and leakage along cable terminations. Terminations shall be thoroughly cleaned and, if required, a guard circuit shall be used at the termination. The installation contractor shall be responsible for repair/replacement of any failed components and retest costs.

2. AC VLF FIELD TEST

2.1 Theory of Operation

The AC Very Low Frequency (VLF) (0.1 Hz sinusoidal) field test is essentially a DC hipot test with a slow voltage oscillation to prevent the buildup of space charge in the cable insulation. The purpose of the test is not to ensure cable system future performance but simply to reassure the construction team that the line is not grounded/shorted before energization. The test is classified

by the IEEE as a destructive test because it is designed to bring a cable and/or accessory to failure where severe defects are present. Thus, the VLF withstand test is a pass/fail test and provides no localization or severity data other than the obvious outward sign of a defect upon failure. Only properly qualified persons may perform this test on FAA ELD systems.

VLF withstand testing is performed after insulation resistance testing. Even if prior insulation resistance testing has indicated that the cable is in good condition, the VLF test may provide a further indication of cable reliability.

Because VLF testing can cause a severe defect in a cable, joints, and/or terminations to fail, provisions should be made to have personnel on-site to find the defective/faulted cable or termination and make the required repairs. Retest the cable after the repairs. Repeat this procedure until cable and terminations pass the VLF test. The installation contractor shall be responsible for repair or replacement of any failed components and retest costs.

2.2 Parameters and Tolerance Limits

For test parameters and tolerance limits, refer to FAA Order 6950.22, *Maintenance of Electrical Power Cables,* Chapter 3, *Standards and Tolerances,* Paragraph 301, Table (see column heading labeled “NEW CABLE”). Also consult IEEE 400.2, *IEEE Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF).*

2.3 Test Schedules

Test after installation and just before energizing the new system.

2.4 Safety and Test Procedure

2.4.1 Safety

Follow general safety practices as set forth in Chapters 1, 2, and 5 of FAA Order 6950.22, *Maintenance of Electrical Power Cables.* Refer also to IEEE 400.2 for safety and grounding procedures, and to the paragraphs below.

VLF testing must comply with OSHA regulations, Standard for Electrical Safety in the Work Place (NFPA-70E), and the National Electrical Safety Code (ANSI C2). ***All medium/high voltage testing must be performed by TWO individuals.*** Before, during, and after testing, ensure that all applicable safety rules are followed, including the use of proper personal protection equipment (PPE), lockout/tagout of all associated electrical energy sources, testing cables for possible "backfeed" from unknown electrical sources, and discharge of residual capacitive charges on cables to be tested.

Before testing is performed, ensure that all cables and associated terminations are disconnected and isolated from all sources of power, including electrical apparatus such as power

transformers, potential transformers, surge arresters, capacitors, etc. Cables are allowed to be connected to switches and fused cutouts as long as the switch isolates the cable and terminations from the electrical apparatus mentioned above. Maintain at least a 6-inch clearance between cable ends and any grounded surface. If modular load-break elbow terminations are used on the cable, ensure the load-break elbows are inserted in the associated isolated parking bushings. Verify that the conductors are not energized and there is no back-feed from some unknown source.

Properly ground all associated cable shields, armor, equipment grounding conductors, and metallic conduit at both ends to an approved earth grounding systems or electrode. Ensure that cable shields and/or armor are electrically continuous from one end of the cable to the other by performing a simple resistance measurement using a reliable and calibrated digital multimeter. Ensure that all insulated conductors in the cable assembly that are not to be tested, as well as adjacent cables, are properly grounded at both ends to prevent capacitive voltage build-up.

When testing, one or more cable ends will need to be remote from the testing site. Therefore, before testing is begun, cables ends under test must be cleared and guarded. Switches and fused cutouts and circuit breakers used for isolating the cable under test shall be identified, locked, and tagged out of service. If possible, remote ends of cable being tested should be enclosed in a locked enclosure, vault, room, or other location accessible to qualified personnel only.

All testing shall be performed between earth/ground and each insulated conductor, and between each insulated conductor. Use only the approved high-voltage power test instruments to check for AC and DC voltages on all cables. ***DO NOT use hand-held test instruments which are only rated (or used in electrical/electronic applications) at 1,000 volts or less!!!***

2.4.2 Test Procedure

If the new cable to be tested is joined to an older, in-service cable segment, consult with the FAA project engineer for guidance. The test voltage or other parameters may need to be adjusted for in-service cables because they are more sensitive to the high voltage levels attained during the test. Likewise, consult the FAA project engineer if two cable segments of different voltage ratings are being tested simultaneously, as the lower rated cable could be damaged by high voltage levels used to test the higher rated segment.

VLF testing is not required for cables with rated voltages less than 5,000 volts.

2.4.2.1 5,000 Volt Cables

For new 5,000 volt cables and terminations, the AC VLF field acceptance test shall be applied at not to exceed 14,000 volts (peak) for a duration of 15 minutes. This covers cables with both 100% and 133% cable insulation ratings. Record the pass or fail condition at the end of the test along with the ambient temperature and relative humidity. ***Because of possible power capacity limitations of the test set, the maximum length of the cable to be tested shall be based on the manufacturer's testing data and the capability of the test equipment.***

2.4.2.2 15,000 Volt Cables

For new 15,000 volt cables and terminations, the AC VLF field acceptance test shall be applied at 28,000 volts (peak) using a VLF test set (High Voltage Inc., type VLF-28CM or approved equal) for a duration of 15 minutes. This covers cables with both 100% and 133% cable insulation ratings. Record the pass or fail condition at the end of the test along with the ambient temperature and relative humidity. ***Because of possible power capacity limitations of the test set, the maximum length of the cable to be tested shall be based on the manufacturer's testing data and the capability of the test equipment.***

CAUTION: After all tests are complete and before the cables and terminations are placed back into normal operation, ENSURE that all temporary safety grounding connections are removed from all insulated conductors that will be energized.

3. OFFLINE 50/60 Hz PARTIAL DISCHARGE TEST

3.1 Theory of Operation

The offline 50/60 Hz partial discharge (PD) test can identify the location and severity of a defect within the new cable or its accessories, including a latent defect missed by hipot tests.
The test uses a 50/60 Hz high-voltage power source and sophisticated signal processing/analysis to detect minute partial discharges (PD) in cable insulation, pinpointing manufacturing weaknesses and workmanship errors. It is a reliable method for detecting defects inadvertently missed during factory tests, defects introduced during transportation and installation, and flaws introduced while handling and splicing the cables. These defects frequently do not appear in normal voltage withstand tests but can eventually cause undesirable service failures weeks, months, or years into the future.

The test is classified by the IEEE as a diagnostic test and not a destructive test (i.e., it is not designed to cause cable and accessories to fail). Due to its requirements for specialized test equipment, signal processing software, and diagnostic skills, the test must be conducted by a third-party testing firm. The testing firm must be a qualified contractor preauthorized by the FAA.

3.2 Parameters and Tolerance Limits

The test is conducted in accordance with IEEE 400.3 using a maximum test voltage of 2.0 to 2.5 times operating voltage level (Uo) for a duration not to exceed 30 seconds.

For test parameters and tolerance limits, refer to FAA Order 6950.22, Maintenance of Electrical Power Cables, Chapter 3, Standards and Tolerances, Paragraph 301, Table (see column heading labeled "NEW CABLE").

3.3 Test Schedules

Test after installation and just before energizing the new system. Allow adequate lead time for test planning with the third party testing firm: about 3 months before project completion for the initial notice, followed by 8 weeks' advance notice for setting up the information-gathering and detailed planning sessions.

3.4 Safety and Test Procedure

3.4.1 Safety

The third-party testing firm shall provide safety briefings at the beginning of each test session. See FAA Order 6950.22, Chapter 5, paragraph 504e(1) and applicable IEEE safety standards.

3.4.2 Test Procedure

For test procedure details, refer to FAA Order 6950.22, Maintenance of Electrical Power Cables, Chapter 5, Paragraph 504.

CAUTION: After all tests are complete and before the cables and terminations are placed back into normal operation, ENSURE that all temporary safety grounding connections are removed from all insulated conductors that will be energized.

APPENDIX D—Acronyms/glossary

AASHTO	American Association of State Highway and Transportation Officials
AC	Alternating Current Advisory Circular
AJW-22	FAA Power Services Group
ALS	Approach Lighting Systems
ANSI	American National Standards Institute
APWA	American Public Works Association
ASCE	American Society of Civil Engineers
ASR	Air Surveillance Radar
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge. A standard for expressing wire diameter. As the AWG number gets smaller, the wire diameter gets larger.
C	Clearance (cable pulling)
°C	Degrees Centigrade
CADD	Computer-Aided Design and Drafting
cmil	Circular Mil(s). Area of a wire that is one-thousandth of an inch (.001 inch, one mil) in diameter.
CN	Concentric Neutral
CONUS	Continental United States
CT	Current Transformer
d	Cable Outside Diameter (cable pulling)
D	Conduit Inside Diameter (cable pulling)
D’	D x 1.05 (cable pulling)
DC	Direct Current
DEB	Direct Earth Buried
DLA	Defense Logistics Agency
DOD	Department of Defense
Duct Bank	A set of parallel conduits made of steel, PVC covered, steel, heavy-walled PVC, or thin-walled PVC in reinforced concrete. Duct banks terminate in utility access holes or vaults. If not enclosed in concrete, duct banks must be of thicker material than thin-walled PVC.
EES	Earth Electrode System
ELD	Electrical Line Distribution (System). An FAA owned and operated electrical power distribution system (underground or overhead) running from a power source to FAA facility load(s). Low-voltage systems such as MASLRs and ODALs, and high-voltage systems such as ALSF-2s are also classified as ELD systems. An ELD may include some or all of the following: power cable; transformers; sectionalizing switchgear; switchpads; disconnect switches; manholes; hand-holes; utility poles; direct earth buried (DEB) cables; and underground duct banks. Runway edge lighting cables, fiber optic communication cables, and control and signal cables are not included as part of ELD.

Electrical Trees
: Tree-like growths consisting of non-solid or carbonized microchannels, which can occur at electric field enhancements such as protrusions, contaminants, voids, or water trees subjected to electrical stress for extended time periods. Partial discharges are responsible for electrical tree growth.

EPT — Electrical PVC Tubing
EPC — Electrical PVC Conduit
f — Coefficient of Friction (cable pulling)
FAA — Federal Aviation Administration
FOTS — Fiber Optic Telecommunications System(s)
ft — Feet
GIS — Geographic Information Systems
GPS — Global Positioning System

Grounding Conductor
: A conductor used to connect equipment or the grounded circuit of a wiring system to the grounding electrode system.

Grounding Electrode
: Copper rod, plate, or wire embedded in the ground for the specific purpose of dissipating electrical energy to the earth.

HAZMAT — Hazardous Materials
HDBK — FAA Handbook
HDPE — High-Density Polyethylene
HH — Hand Hole
HIPOT — High Potential (Test)
Hz — Hertz
ICEA — Insulated Cable Engineers Association
IEC — International Electrotechnical Commission
IECA — Insulated Cable Engineers Association
IEEE — Institute of Electrical and Electronics Engineers
in. — Inch(es)
ISO — International Standards Organization
JO — FAA Order
kg — Kilogram(s)
kV — Kilovolt(s)
L — Length of Cable (cable pulling)
lb — Pound(s)
LV — Low Voltage (Typically 600 V and Below for FAA ELD Systems)
m — Meter(s)
MCOV — Maximum Continuous Operating Voltage
MH — Manhole
mH — Millihenry(s)
MIL-STD — Military Standard
MIL-I — Military Specification
mil — Unit of Length, Equal to One Thousandth (10^{-3}) of an Inch (0.0254 millimeter)
mm — Millimeter
MOV — Metal Oxide Varistor

MV	Medium Voltage (600 V to 37.5 kV)
NAS	National Airspace System
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NRTL	Nationally Recognized Testing Laboratory
OPR	Office of Primary Responsibility
OSHA	Occupational Safety and Health Administration
Pa	Pascal(s)
pC	Picocoulomb(s)
PD	Partial Discharge
PMO	Program Management Office
PPE	Personal Protective Equipment
psi	Pounds per Square Inch
PSG	Power Services Group
PTFE	Polytetrafluoroethylene (Teflon™)
PVC	Polyvinyl Chloride
PWRFRQ	Power Frequency (Test)
Qualified Person (Electrical)	A person knowledgeable in the construction and operation of electric power generation, transmission, and/or distribution equipment, along with associated hazards. Also known as "qualified worker."
R	Radius of Bend (cable pulling)
Rated Voltage (Cable)	Manufacturer's specified maximum voltage at which the cable can operate.
rms	Root Mean Square
RMC	Rigid Metal Conduit
RSA	Runway Safety Area. Areas of a runway established to enhance safety in the event of an aircraft undershoot, overrun, or excursion from the side of the runway.
SDR	Standard Dimensional Ratio, defined as the ratio of the average conduit diameter divided by the minimum wall thickness.
SPD	Surge Protection Device
STD	FAA Standard
SWBP	Sidewall Bearing Pressure (cable pulling)
T	Total Pulling Tension (cable pulling)
TR-XLPE	Tree-retardant XLPE
TSA	Taxiway Service Area
U_o	Operating Voltage, Line to Ground
UFC	Unified Facilities Criteria
UFGS	Unified Facilities Guide Specification (DOD). The UFGS was founded by the Secretary of Defense and mandated by the Department of Defense for all Military Services to unify their specifications into one database.
UL	Underwriters' Laboratory
UV	Ultraviolet

V	Volt(s)
VLF	Very Low Frequency
VORTAC	VOR/Tactical Air Navigation
w	Weight of Conductors (cable pulling)
W	Weight correction factor (cable pulling)
Xfmr	Transformer
XLPE	Cross-Linked Polyethylene

APPENDIX E—Submittals Matrix

Contractor-generated design data	
• Code analysis (e.g., voltage drops, clearance calculations, design arc flash study, etc) (ANSI C2)	A Required.
• Design assumptions and parameters (FAA-STD-032)	B ☐ Not required for this project (check block).
• Test reports and findings (e.g., soil resistivity, load bearing, frost analysis, etc)	C ☐ Required for this project (check block).
• Design calculations (FAA-STD-032)	A Required.
• Contractor-generated design drawings or sketches.	A Required.
Cost estimates	A Required.
Medium voltage cable	A Required.
Medium voltage cable splices and joints*	A Required.
Medium voltage cable terminations*	A Required.
Conduits	A Required.
Duct construction materials (e.g., concrete, alternatives to concrete where approved, fills and layers, etc)	A Required.
Switch pads and sectionalizing switchgear	A Required.
Transfer switches (automatic and manual)	A Required.
Transformers	A Required.
Surge arresters	A Required.
Live end caps or protective caps	A Required.
Precast concrete structures	A Required.
Sealing Material	B ☐ Not required for this project (check block).
Manhole frames and covers	A Required.
Hand hole frames and covers	A Required.
Cable supports (racks, arms and insulators)	A Required.
Protective devices and coordination study	A Required.
As-built arc flash hazard study. Required when an existing study is not available, or if modifications are being made to the existing ELD system.	A Required.

Electrical equipment factory test reports		
Medium voltage cable factory certified test result report as per FAA-E-2793, Section 4.2 (includes meeting ICEA S-94-649, Sections 4.3.2.1 and 9.13).	A	Required.
Transformers	A	Required.
Switchgear, including sectionalizing switchgear	A	Required.
Disconnects	A	Required.
Other components	B ☐	Not required for this project (check block).
Field acceptance checks and tests (see Appendix C)	A	Required.
Arc-proofing test for cable fireproofing tape	C ☐	Required for this project (check block).
Cable installation plan and procedure		
• Site layout drawing with cable pulls numerically identified	C ☐	Required for this project (check block).
• List of equipment used, with calibration certifications	C ☐	Required for this project (check block).
• The manufacturer, type, and quantity of lubricant used on pull	C ☐	Required for this project (check block).
• The cable manufacturer and type of cable	C ☐	Required for this project (check block).
• The dates of cable pulls, time of day, and ambient temperature	C ☐	Required for this project (check block).
• The length of cable pull and calculated cable pulling tension (calculated value, not maximum value). A single generic table of cable pulls may be submitted.	C ☐	Required for this project (check block).
• The calculated maximum cable pulling tension	A	Required.
• The calculated maximum cable sidewall pressure	A	Required.
Cable splicer/terminator qualifications* [A]	A	Required.
Cable installer qualifications* [A]	A	Required.
Project design drawings [A]	A	Required.

APPENDIX F—HDPE-to-HDPE and HDPE-to-PVC Conduit Adhesive - Sample Product

BonDuit®

Conduit Adhesive

American Polywater's

BONDS to Polyethylene, PVC, Fiberglass, Metals and more

BonDuit® Conduit Adhesive is a unique two-part adhesive system used to transition-splice conduits (innerducts) of different types. BonDuit® Adhesive in 5 minutes makes a strong, durable splice that is air/water tight. Requires no expensive equipment.

Estimated Load Capacity and Usage

Conduit Diameter	Polyethylene Conduit to PVC Standard Coupling	
	Coupling length	Pullout Force
1 inch	2 ⅞ inch	760 lbs_f
1 ½ inch	2 ⅞ inch	1,140 lbs_f
2 inch	2 ½ inch	1,520 lbs_f
4 inch	3 ¾ inch	4,560 lbs_f

Results are based on careful surface preparation and a 24-hour cure at 70° F. Under these cure conditions; the load will reach 50% capacity after one hour and fully cured in 24 hours. To create air-tight joints for air-assisted cable installation, a cure time of 2 hours at 70°F is recommended. BonDuit® Conduit Adhesive is not designed for high stress pulls, such as those in HDD installations.

Numbers of Applications

BonDuit® Conduit Adhesive kit contain the materials necessary to prepare plastic and metal surfaces for bonding. By following the instructions, a strong joint takes just minutes. Each cartridge contains enough material for numerous applications, depending on the size of each coupling or joint.

Conduit Size	Applications per Cartridge
1 inch	20-30
1 ½ inch	12-18
2 inch	10-15
4 inch	4-6

APPENDIX G—Installation of Low-Voltage MALSR Systems and High-Voltage ALSF Systems

G.1 ALSF Systems

G.1.1 SYSTEM: NEW BEDFORD PANORAMEX CORPORATION (NBP)

Reference: TI 6850.87 *DUAL MODE HIGH INTENSITY APPROACH LIGHTING SYSTEM (ALSF-2/SSALR) SYSTEM TYPE FA-10700*, Vol. III, paragraph 9.6.2.3, *Lighting Field Preparation*.

Figures 9-4, 9-5, and 9-6 of the above TI show a typical lighting field concrete pad, conduit, and cable routing; typical pullbox, ICC, and junction box concrete pad, conduit, and cable routing. Install equipment and conduits as specified by the approved FAA design drawings. Basic installation process is as follows:

a. Locate the installation site and dig trenches capable of accommodating wiring specified on the installation drawings. These trenches shall be deep enough to bury the wiring/conduit below the frost line. A trench will be required for the wiring/conduit that carries main power to the substation building. Specific features of the conduit installation will be determined by the requirements of the site. Follow the guidelines as provided in the site approved design/installation drawings.

b. Install wiring/conduit in the trenches. Backfill the trenches.

c. Install wiring/conduit for pullbox, ICC, and junction box as specified by the approved FAA design drawings.

Note: The details are in the approved design drawings, not the TI text or figures.

G.1.2 SYSTEM: AIRFLO INSTRUMENT COMPANY

Reference: TI 6850.69 *DUAL MODE HIGH INTENSITY APPROACH LIGHTING SYSTEM (ALSF-2/SSALR) TYPE FA-10048*, Section 9.5, *Installation Procedure*.

Install the ASLF-2/SSALR Lighting System in accordance with the approved FAA design drawings. Basic installation process is as follows:

a. Locate the installation site and dig trenches capable of accommodating wiring specified on the installation drawings. These trenches shall be deep enough to bury the wiring/conduit below the frost line. A trench will be required for the wiring/conduit that carries main power to the substation building. Specific features of the conduit installation will be determined by the requirements of the site. Follow the guidelines as provided in the site approved design/installation drawings.
b. Install wiring/conduit in the trenches. Backfill the trenches.

c. Install wiring/conduit for pullbox, ICC, and junction box as specified by the approved FAA design drawings.

G.1.3 SYSTEM: GODFREY ENGINEERING
Reference: TI 6850.56 *DUAL MODE HIGH INTENSITY APPROACH LIGHTING SYSTEM (ALSF-2/SSALR) TYPE FA-9993*, Section 9.5, *Installation Procedure*.

Install the ASLF-2/SSALR Lighting System in accordance with the approved FAA design drawings. Basic installation process is as follows:

a. Locate the installation site and dig trenches capable of accommodating wiring specified on the installation drawings. These trenches shall be deep enough to bury the wiring/conduit below the frost line. A trench will be required for the wiring/conduit that carries main power to the Substation Building. Specific features of the conduit installation will be determined by the requirements of the site. Follow the guidelines as provided in the site approved design/installation drawings.

b. Install wiring/conduit in the trenches. Backfill the trenches.

G.1.4 SYSTEM: ADB-ALNACO INC.
Reference: TI 6850.55 *ALSF-2 / SSALR SEQUENCED FLASHING LIGHT SYSTEM TYPE FA 9988* (Referenced from 6850.56, Section 9.2). See paragraph 9.5**,** *Installation of Equipment***).**

a. Refer to the project plans, specifications, and drawings for specific installation instructions.

b. Install wiring/conduit for pullbox, ICC, and junction box as specified by the approved FAA design drawings.

G.2 MALS/MALSF/MALSR Systems

G.2.1 SYSTEM: MULTI ELECTRIC MFG. INC.
(Reference applicable TI, Facility Standards D-6213 (1981), site installation as-built drawings, and specification FAA-C-2626.)

Reference: TI 6850.1A, *MEDIUM INTENSITY APPROACH LIGHTING SYSTEM TYPE FA-8091* (1948)

Reference: TI 6850.7, *MALSR MEDIUM INTENSITY APPROACH LIGHTING SYSTEM WITH SEQUENCED FLASHES TYPES FA-8767 and FA-8767-1* (1972)

G.2.2 SYSTEM: GTE SYLVANIA
(Reference applicable TI, Facility Standards D-6213 (1981), site installation as-built drawings, and specification FAA-C-2626.)
Reference: TI 6850.9, *MEDIUM INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR LIGHTS (MALSR) TYPE FA-8982* (1973)

G.2 3 SYSTEM: MULTI ELECTRIC MFG. INC.
(Reference applicable TI, Facility Standards D-6213 (1981), site installation as-built drawings, and specification FAA-C-2626.)

Reference: TI 6850.12, *MALSR MEDIUM INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR LIGHTS TYPE FA-9425* (1974)

G.2.4 SYSTEM: SEPCO DIVISION, Connecticut International Corp.
(Reference applicable TI, Facility Standards D-6213 (1981), site installation as-built drawings, and specification FAA-C-2626.)

Reference: TI 6850.38, *MALSR MEDIUM INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR LIGHTS TYPE FA-9629* (1977)

G.2.5 SYSTEM: MULTI ELECTRIC MFG. INC.
(Reference applicable TI, Facility Standards D-6213 (1981), site installation as-built drawings, and specification FAA-C-2626.)

Reference: TI 6850.49, *MALS MEDIUM INTENSITY APPROACH LIGHTING SYSTEM TYPE FA-9877* (1979)

Reference: TI 6850.62, *MALSR/MALS MEDIUM INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR LIGHTS TYPE FA-9994* (1980)

G.2.6 SYSTEM: GODFREY ENGINEERING
(Reference applicable TI, Facility Standards D-5240 (1986), site installation as-built drawings, and specification FAA-C-2626.)

Reference: TI 6850.70, *MEDIUM INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR LIGHTS (MALSR) TYPE FA-10097* (1986)

Reference: TI 6850.82, *MEDIUM INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR LIGHTS (MALSR) TYPE FA-10267* (1988)

G.2.7 SYSTEM: AVW ELECTRONIC SYSTEMS
(Reference applicable TI, Facility Standards D-6292 (1998 - updated), site installation as-built drawings, and specification FAA-C-2626.)

Reference: TI 6850.85, *MEDIUM INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR LIGHTS (MALSR) AND REMOTE MONITORING SUBSYSTEM (RMS) TYPE FA-10290* (1992)

G.2.8 SYSTEM: DME CORPORATION
(Reference applicable TI, Facility Standards D-6292 (1998 - updated), site installation as-built drawings, and specification FAA-C-2626.)

Reference: TI 6850.89, *MEDIUM INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR LIGHTS (MALSR) AND REMOTE MONITORING SUBSYSTEM TYPE FA-11500* (1994)

Reference: TI 6850.97, *MEDIUM INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR LIGHTS (MALSR) TYPE FA-17900* (TYPE FA-11501 or FA-21000 POWER & CONTROL ASSEMBLY) (2009 - Updated)

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Attachment 5

FAA-STD-019f

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FAA-STD-019f, Chg 1
April 4, 2019

DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION

STANDARD

LIGHTNING AND SURGE PROTECTION, GROUNDING, BONDING, AND SHIELDING REQUIREMENTS FOR FACILITIES AND ELECTRONIC EQUIPMENT

FOREWORD

1. Construction of Federal Aviation Administration (FAA) operational facilities and the electronic equipment installed therein shall conform to this standard. This standard defines minimum requirements for FAA facilities. When specific needs of a facility exceed these minimum requirements, the facility design and construction shall meet the specific needs. The equipment type, configuration, and location along with the configuration of site structures and environmental/weather conditions influence these needs.

2. The requirements herein reflect lessons learned from investigation and resolution of malfunctions and failures experienced at field locations. The FAA thus considers these requirements the minimum necessary to harden sites sufficiently for the FAA missions – to prevent delay or loss of service, to minimize or preclude outages, and to enhance personnel safety. Further, the requirements herein are coordinated with industry standards, and in some cases exceed industry standards where necessary to meet the FAA missions.

3. The use of "shall" or verbs such as "provide," "construct," "weld," or "connect" indicates mandatory compliance. Deviations are permissible in cases when implementation of certain requirements is not technically feasible, and in such cases, the FAA shall submit a National Airspace System (NAS) Change Proposal (NCP) with justification and technical documentation, and receive approval by the NAS Configuration Control Board (CCB).

4. The format and content requirements of this standard are in accordance with FAA-STD-068, and the grammar and style are in accordance with the Government Printing Office (GPO) Style Manual.

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List of Figures

Note. *Colors in figure illustrations distinguish the fundamental elements of the grounding system concept and do not represent color-coding or labeling requirements of this standard.*

List of Tables

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1 SCOPE

This standard establishes design, procurement, installation, construction, and evaluation standards for lightning protection, transient surge protection, grounding, bonding, shielding configurations and procedures, and control of electrostatic discharge (ESD).

1.1 Applications

The requirements of this standard are mandatory for both new facilities and modifications and upgrades to existing facilities, new equipment installations, and new electronic equipment procurement used in the National Airspace System (NAS) facilities.

The use of the term "facilities" herein can differ from the manner in which it is frequently used in other Federal Aviation Administration (FAA) documents. In this standard, facilities may refer to an entire building, tower, interior or exterior system(s), or portions thereof which support the NAS and its operation. The physical proximity of the system(s) or equipment typically defines a single facility, while significant physical separation of the system or equipment defines separate facilities.

This standard covers government owned or leased property and "facilities."

a. Contractor-Owned Equipment Interface. The interface between contractor-owned equipment or electronic equipment not used for operational purposes, such as administrative local area network (LAN), administrative telephone, and the operational NAS facilities shall be in accordance with this standard.

1.2 Tailoring of Mandatory Requirements

The FAA recommends that the Office of Primary Responsibility (OPR) is contacted to obtain technical guidance on the applicability of requirements herein for modifications, upgrades, and new equipment installations in existing facilities.

a. Application for Previously Funded Programs. This standard is not mandatory for programs funded prior to the issue date of this standard, nor is it mandatory for construction contracts associated with programs funded prior to the issue of the standard. Application of this standard is at the discretion of the user for programs funded prior to the issue of the standard.

b. Mandatory Applications. The OPR can mandate the use of this standard for programs started before the issue date of this standard, if funding is provided.

1.3 Purpose

The requirements of this standard provide a systematic approach to minimize electrical hazards to personnel, and minimize electromagnetic interference (EMI) that can cause damage to facilities and electronic equipment from lightning, transients, ESD, and power faults.

1.4 Content Organization

The standard is organized in accordance with FAA-STD-068.

FAA-STD-019F Content Arrangement		
FOREWORD	⇨	Normative Process Information
1 SCOPE	⇨	This chapter contains: a. Scope Statement b. Applicability Statement for mandatory compliance with requirements c. Procedure for Tailoring of Mandatory Requirements
2 APPLICABLE DOCUMENTS	⇨	This chapter includes technical documents used in this standard.
3 DEFINITIONS	⇨	This chapter contains definitions essential to the understanding and application of this standard. It is not intended to include commonly defined general or technical terms from building codes or industry standards.
4 GENERAL REQUIREMENTS	⇨	This chapter addresses the general grounding system requirements commonly included in building codes and industry standards, and covers the general common requirements and standard practice for the overall design, installation, construction, and evaluation for FAA installations. The general requirements of industry codes and standards are often too general for many FAA applications. This chapter is organized to define and build upon the requirements of general industry standards and building codes as they relate to FAA applications. This chapter includes the following parts: a. Bonding Requirements b. Lightning Protection System Requirements c. Earth Electrode System Requirements d. National Electrical Code Power Distribution System Grounding Compliance e. Surge Protective Device Requirements f. Grounding and Bonding Requirements for NAS Electronic Equipment Areas g. Shielding Requirements h. Electrostatic Discharge Requirements

FAA-STD-019F Content Arrangement (continued)		
5 DETAILED REQUIREMENTS		This chapter describes detailed performance requirements, which are specific to FAA facility applications, organized by facility special conditions and equipment as follows: a. Airport Traffic Control Tower Facilities b. Lightning Protection System – Special Conditions c. Facility Transient Protection – Special Conditions d. Single Point Ground System (SPG) – Special Conditions e. NAS Electronic Equipment – Interface and Procurement Requirements f. Surge Protective Device (SPD) – Procurement Requirements g. Electrostatic Discharge Equipment – Interface and Specification Requirements h. Electromagnetic Compatibility Requirements
6 NOTES		This chapter includes: a. Acronyms and Abbreviations b. Guidelines and References Notes c. Version Cross-Reference d. Bibliography Document conventions: Designations indicated with brackets, e.g., " [A1] " preceding a section or paragraph title denote that explanatory material is provided in section 6.2. Designations indicated with brackets, e.g., " [B1] " preceding a section or paragraph title indicates that bibliography reference material is provided in section 6.4.

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2 APPLICABLE DOCUMENTS

2.1 General

Documents listed in this chapter are government and non-government reference documents that form a part of this standard and are applicable to the extent specified herein. While every effort has been made to ensure the completeness of this list, document users are cautioned that they shall meet all specified requirements of documents cited in Chapters 3, 4, and 5 of this standard, and national safety standards, whether or not they are listed.

a. In the event of a conflict between the text of this standard and the references cited herein, the text of this standard takes precedence. Nothing in this standard shall supersede applicable laws and regulations unless a specific exemption has been obtained.

b. Bibliography and reference source material is included in Chapter 6.

2.2 Government Documents

Due to periodic updating of government documents, the Contracting Officer and/or the Implementation Engineer shall specify the current version for project design or at contract award.

2.2.1 FAA Specifications

FAA-C-1217	Electrical Work, Interior
FAA-G-2100	Electronic Equipment, General Requirements
FAA-STD-012	Paint Systems for Equipment

2.2.2 FAA Orders and Handbooks

FAA-HDBK-010	Recommended Practices and Procedures for Lightning and Surge Protection, Grounding, Bonding, and Shielding Implementation
FAA-HDBK-011	Fundamental Considerations of Lightning Protection and Surge Protection, Grounding, Bonding, and Shielding

Copies of FAA specifications, standards, orders, and other applicable documents may be obtained from the Contracting Officer issuing the invitation-for-bid or request-for-proposal. Requests for this material should identify the material desired, for example, the specifications, standards, amendments, drawing numbers and dates. Requests should cite the use for the material, invitation-for-bid, request-for-proposal, the contract number, or other intended use.

2.2.3 Military Documents

MIL-HDBK-232	Revision A Red/Black Engineering-Installation Guidelines
MIL-HDBK-237	Electromagnetic Compatibility Management Guide for Platforms, Systems and Equipment
DOD/MIL-HDBK-263	Electrostatic Discharge Control Handbook
DOD-STD-1686	Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)
MIL-HDBK-419	Grounding, Bonding, and Shielding for Electronic Equipment and Facilities

MIL-PRF-87893	Performance Specification, Workstation, Electrostatic Discharge Control
MIL-W-87893	Military Specification Workstation, Electrostatic Discharge (ESD) Control
MIL-STD-461	The Control of Electromagnetic Interference Emissions and Susceptibility
MIL-STD-889	Dissimilar Metals
MIL-STD-1686	Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment (Excluding Electrically Initiated Explosive Devices)
NACSIM 5203	Guidelines for Facility Design and Red/Black Installation (Confidential Document)
Single copies of Military specifications, standards, and handbooks are available by mail or telephone from Document Automation and Production Service Customer Service, Standardization Documents Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094. http://quicksearch.dla.mil/ Not more than five items may be ordered on a single request and all requests must contain the document number. Only the latest revisions (complete with latest amendments) are available. Slash sheets must be individually requested. The Invitation for Bid or Contract Number should be cited where applicable.	

2.3 Non-Government Documents

Due to periodic updating of non-government documents, the Contracting Officer and/or the Implementation Engineer must specify the current version for project design or at contract award unless a specific version is identified in this standard. These documents form a part of this standard and are applicable to the extent specified herein. While this standard may exceed the requirements of the following documents, building codes and industry standards always shall be followed as a minimum.

2.3.1 Electronic Industries Alliance (EIA)

JEDEC Standard JESD625	Requirements for Handling Electrostatic-Discharge-Sensitive (ESDS) Devices
Copies of EIA Standards are available from JEDEC Solid State Technology Association, Mailing Address: 3103 North 10th Street, Suite 240-S, Arlington, VA 22201-2107. https://www.jedec.org/	

2.3.2 National Fire Protection Association (NFPA)

NFPA 70	National Electrical Code (NEC)
NFPA 77	Recommended Practice on Static Electricity
NFPA 780	Standard for the Installation of Lightning Protection Systems
Copies of NFPA documents are available from the National Fire Protection Association, One Batterymarch Park, Quincy, MA 02269. www.nfpa.org	

2.3.3 Underwriters Laboratories (UL)

UL 96	Lightning Protection Components
UL 96A	Installation Requirements for Lightning Protection Systems
UL 779 (ANSI-A148.1)	Electrically Conductive Floorings
UL 1449	Standard for Surge Protective Devices
Copies of UL documents are available from Global Engineering Documents, 1500 Inverness Way, East Englewood, CO 80112. Telephone 303-397-7945, 800-854-7179. www.ul.com	

2.3.4 Institute of Electrical and Electronic Engineers (IEEE)

ANSI/IEEE C62.41.2	Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
ANSI/IEEE C62.45	Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits
ANSI/IEEE 1100	Recommended Practice for Powering and Grounding Sensitive Electronic Equipment (Emerald Book)
Copies of IEEE documents are available from Institute of Electrical and Electronic Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-9916. www.ieee.org	

2.3.5 Electrostatic Discharge (ESD) Association Documents

ESD ADV1.0	Electrostatic Discharge Terminology - Glossary
ESD ADV53.1	ESD Protective Workstations
ESD S4.1	Worksurfaces Resistance Measurements
ANSI/ESD S8.1	Symbols - ESD Awareness
ANSI/ESD S20.20	Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment
ANSI/ESD STM 7.1	Floor Materials - Resistive Characterization of Materials
ANSI/ESD STM 11.11	Surface Resistance Measurement of Static Dissipative Planar Materials
ANSI/ESD STM 12.1	Seating - Resistive Measurement
ESD TR20.20	Handbook for the Development of an Electrostatic Discharge Control Program for the Protection of Electronic Parts, Assemblies and Equipment
ANSI/ESDA/JEDECD JS-001	ESDA/JEDEC Joint Standard for Electrostatic Discharge Sensitivity Testing - Human Body Model (HBM) - Component Level
Copies of ESD Association documents are available from the EOS/ESD Association, Inc. 7900 Turin Road, Building 3, Rome, NY 13440-2069. Telephone 315-339-6937. www.esda.org	

2.3.6 Telecommunication Industry Association (TIA) Documents

TIA-222	Structural Standard for Antenna Supporting Structures and Antennas
Copies of TIA documents are available from the Telecommunications Industry Association, 1320 North Courthouse Road, Suite 200, Arlington, VA 22201. Telephone 703-907-7700. www.tiaonline.org/standards/	

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3 DEFINITIONS

A	
Access Well	A covered opening in the earth using concrete or other cementitious material to provide access to an EES connection.
Armored Cable	Power, signal, control, or data cable having an overall armor or covering constructed of ferrous (steel) material that provides both structural protection and electromagnetic shielding for direct buried cables.
Arrester	Components, devices, and circuits used to attenuate, suppress, limit, or divert adverse electrical surge and transient energy. The terms arrester, suppressor, and protector are used interchangeably, except the term “arrester” is used herein for components, devices, and circuits installed on the primary side of FAA-owned distribution transformers.
B	
Bond	The electrical connection between two metallic surfaces used to provide a low-resistance path between them.
Bond, Direct	An electrical connection utilizing continuous metal-to-metal contact between the members being joined.
Bond, Indirect	An electrical connection employing an intermediate electrical conductor between the bonded members.
Bonding	The joining of metallic parts to form an electrically conductive path to ensure electrical continuity and the capacity to conduct current imposed between the metallic parts.
Bonding Jumper	A conductor installed to ensure electrical conductivity between metal parts required to be electrically connected.
Bonding Jumper, for NEC Compliance	See NEC definitions for power distribution wiring terms such as "Equipment," "Main," or "System" bonding jumper.
Branch Circuit	The circuit conductors between the final overcurrent protective device and the load.
Building “*Structural*” Steel	The main building structural steel members consisting of columns and beams or girders. Concrete-encased reinforcing steel rebars may be considered structural steel, depending on location.
Bulkhead Ground Plate	A metallic plate located where conduits, conductors, cables, waveguides, etc, enter the facility from the exterior. The bulkhead plate provides a central point for the grounding of these services to minimize external transients from entering the facility or structure.
Bushing	An insulated device that allows an electrical conductor to pass safely through a grounded conducting barrier such as the case of a panel, transformer, etc. The primary purpose is to prevent chafing of the conductors.
Bushing, Grounding or Bonding	An insulated device that allows for a grounding method at the end of the conduit. Also known as grounding-type bonding bushing or bonding bushing.
C	
Cabinet	An enclosure designed either for surface mounting or flush mounting that is provided with a frame, mat, or trim in which a swinging door or doors are, or can be, supported.
Cable	A fabricated assembly of one or more conductors in a single outer insulation. Types include axial, armored, and shielded.

Cable, AC	A fabricated assembly of insulated conductors in a flexible metallic enclosure. Type armored-cable (AC) cable is not the same as DEB cable.
Cable, Axial	Cable where all conductors are oriented on a single axis, such as coaxial, biaxial, and tri-axial cables.
Cable, Direct Buried	Cable with construction suitable for use in direct buried, underground installations without any form of conduit. Type direct buried cable is not the same as DEB cable.
Cable, Direct Earth Burial (DEB)	Cable with a ferrous shield designed to provide both physical and electromagnetic protection to the conductors.
Cable, MC	Metal-Clad Cable, Type MC. A factory assembly of one or more insulated circuit conductors with or without optical fiber members enclosed in an armor of interlocking metal tape, or a smooth or corrugated metallic sheath. See NEC. Note: For the purpose of this standard, MC cable is only permitted when installed in accordance with FAA-C-1217.
Cable, Shielded	Cable with a metalized or braid shield to improve resistance to electromagnetic interference (EMI).
Case	A protective housing for a unit or piece of electrical or electronic equipment.
Chassis	The metal structure that supports the electrical or electronic components that make up the unit or system.
Conductor, Bare	An electrical conductor that has no covering or electrical insulation.
Conductor, Insulated	An electrical conductor encased within material of composition and thickness recognized by the NEC as electrical insulation.
Conductor, Lightning Bonding (Secondary)	An electrical conductor used to bond a metal object, within the zone of protection and subject to currents induced by lightning strikes, to the lightning protection system.
Conductor, Lightning Down	The down conductor serves as the path to the EES from the roof system of air terminals and roof conductors or from an overhead ground wire.
Conductor, Lightning Main	Conductors intended to carry lightning currents between air terminals and the EES. These can be conductors interconnecting air terminals on the roof, conductors connecting a metal object on or above the roof level that is subject to a direct lightning strike to the lightning protection system, or the down conductor.
Conductor, Lightning Roof	Roof conductors interconnecting all air terminals to form a two-way path to the EES from the base of each air terminal.
E	
Earth Electrode System (EES)	A network of electrically interconnected grounding systems such as ground rods, ground plates, ground mats, incidental electrodes including metallic piping and tanks, or ground grids installed below grade to establish a low resistance contact with earth.
Electromagnetic Interference (EMI)	Any emitted, radiated, conducted, or induced voltage that degrades, obstructs, or interrupts the required performance of electronic equipment.

Electronic Multipoint Ground System (MPG)	An electrically continuous network consisting of interconnected ground plates, equipment racks, cabinets, conduit junction boxes, raceways, duct work, pipes, copper grid system, building framing steel, and other non-current-carrying metal elements. It includes conductors, jumpers, and straps that connect individual electronic equipment components to the signal reference structure (SRS).
Electronic Single Point Ground System (SPG)	A discreet signal reference network that provides a single point of reference in the facility for electronic equipment which require single point grounding. It consists of conductors, plates, and equipment terminals, all of which are isolated from any other grounding system except at the main ground plate.
Enclosed Cable Tray	A cable tray with steel/aluminum sides and bottom with a steel/aluminum cover or lid.
Equipment	A general term including materials such as fittings, devices, appliances, fixtures, apparatus, and machines, used in conjunction with an electrical installation.
Equipment Areas	Areas that house electronic equipment used to support NAS operations, such as electronic equipment rooms, telephone company (TELCO) rooms, Very High Frequency Omni Directional Range (VORs), and Radars.
Equipment Grounding Conductor (EGC)	The conductive path installed to connect normally non-current-carrying metal parts of equipment together and to the system grounded conductor or to the grounding electrode conductor, or both. For FAA purposes, the EGC is to be green-insulated, solid or stranded, copper wire.
F	
Ferrous Conduit	Conduits composed of or containing iron, which are used to provide magnetic shielding, such as Rigid Galvanized Steel Conduit (RGS) or thick walled threaded conduit (NEC Rigid Metal Conduit-RMC). Note: For the purpose of this standard, Electrical Metallic Tubing (EMT), Intermediate Metal Conduit (IMC), and conduits made from silicon bronze and stainless steel are not adequate for magnetic shielding protection.
Fitting, High Compression	See “Pressure Connector Terminations.”
G	
Ground	A conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to a conducting body that serves in place of the earth.
Ground Dissipation Plate Design	Ground plate, refer to Figure 6.
Grounded	Connected to earth via a path of sufficiently low impedance and having sufficient current carrying capacity, such that fault current cannot build up voltage potentials that are hazardous to personnel.
Grounded Conductor	A system or circuit conductor that is intentionally grounded at the SDM or at the source of a separately derived system. This grounded conductor is the neutral conductor for the power system.
Grounding Conductor	A conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode or electrodes.

Grounding Electrode	Copper rod, plate, or wire embedded in the ground for the specific purpose of dissipating electric energy to the earth. Also referred to as the Grounding Electrode System.
Grounding Electrode Conductor (GEC)	A conductor used to connect the system grounded conductor or the equipment to a grounding electrode or to a point on the grounding electrode system.
H	
High Frequency	All electrical signals at frequencies greater than 100 kHz, and pulse and digital signals with rise and fall times of less than 10 µs.
High Transient Ground Plate	Entry or termination ground plate for connection of axial cable surge protection equipment and termination of cable shields, waveguides, conduits, and cable jackets. See Bulkhead Ground Plate.
Horizontal Transitions	Architectural term used to describe horizontal elements in a vertical structure, such as floor levels and stair landings.
Hydraulically Crimped Termination	Conductor termination using a hydraulic crimping tool that applies a 12-ton minimum compression force, using concentrically or circumferentially matching dies to form the connection.
I	
Inaccessible Location	A condition where gaining access to a system or part thereof requires significant effort, cost, or risk to personnel safety. Examples of such locations include below grade, behind walls and obstructions, or enclosed or concealed spaces that impede visual inspection.
L	
Landline	Any conductor, line, or cable installed externally above or below grade to interconnect electronic equipment in different facility structures or to interconnect externally mounted electronic equipment.
Low Frequency	Voltages and currents, whether signal, control, or power, up to and including 100 kHz. Pulse and digital signals with rise and fall times of 10 µs or greater are considered to be low-frequency signals.
M	
Main Service Disconnect	A switch, fused switch, or circuit breaker that disconnects the main ac power service, generally utility power source, from a facility, located at the service disconnecting means (SDM).
O	
Office of Primary Responsibility (OPR)	The authority assigned to maintain and interpret this standard.
Operational Areas	Areas used to provide NAS support such as Instrument Flight Rules (IFR) rooms, Air Route Traffic Control Center (ARTCC) control rooms, ATCT tower cabs, operations control centers, and TRACON control rooms.
P	
Pressure Connector Terminations	Conductor termination using a mechanically bolted pressure connection.

R	
Rack	A metal frame in which one or more electronic equipment units are mounted.
Rigid Metal Conduit (RMC), Rigid Galvanized Steel Conduit (RGS)	A threaded raceway of circular cross-section designed for the physical protection, routing, and shielding of conductors and cables.
S	
Service Disconnecting Means (SDM)	Refer to the NEC definition for Service Point location.
Shield	A housing, shield, or cover that substantially reduces the coupling of electric and magnetic fields into or out of circuits or prevents accidental contact of objects or persons with parts or components operating at hazardous voltage levels.
Signal	Any electromagnetic transmission of information or control function. A signal can be analog, digital data, or a control function such as a relay closure.
Signal Reference Structure (SRS) System	The conductive terminal, wire, bus, plane, or network that serves as the relative zero potential for all associated electronic signals. Signal Reference Structures are required at locations or areas containing NAS electronic equipment.
Structure	Any fixed or transportable building, shelter, tower, mast, or other load-bearing system that is intended to house electrical or electronic equipment or otherwise support or function as an integral element of the air traffic control system.
Surface Resistivity	Surface Resistivity can be described as follows: For electric current flowing across a surface, the ratio of DC voltage drop per unit length to the surface current per unit width. In effect, the surface resistivity is the resistance between two opposite sides of a square and is independent of the size of the square or its dimensional units. Surface resistivity is expressed in ohms/square. See ESD ADV1.0 Glossary of Terms.
Surge	A short-term disturbance characterized by a sharp, brief discontinuity of a waveform. May be of either polarity and may be additive to, or subtractive from, the normal waveform.
Surge Protective Device (SPD)	A device intended to limit surge voltages on equipment by diverting or limiting surge current and is capable of repeating these functions as specified. SPDs are also commonly referred to as Transient Voltage Surge Suppressors (TVSS) or secondary surge arresters.
Susceptibility Level	The transient level on signal, control, or data lines that causes damage, degradation, or upset to electronic circuitry connected to the line.
T	
Transient	See Surge.
Transient Suppressor	Components, devices, or circuits designed for the purpose of attenuating, absorbing, and suppressing conducted transient and surge energy to protect facility equipment.
Z	
Zone of Protection	The space adjacent to a lightning protection system that has a reduced probability of receiving a direct lightning strike.

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4 GENERAL REQUIREMENTS

4.1 Introduction

This chapter covers the common requirements and standard practice for the overall design, installation, construction, and evaluation of the following grounding systems in FAA facilities:

a. Bonding Requirements

b. Lightning Protection System Requirements

c. Earth Electrode System (EES) Requirements

d. National Electrical Code (NEC) Power Distribution System Grounding Compliance

e. Surge Protective Device (SPD) Requirements

f. Grounding and Bonding Requirements for NAS Electronic Equipment Areas

g. Shielding Requirements

h. Electrostatic Discharge (ESD) Requirements

4.2 Bonding Requirements

The method of bonding, for the purpose of achieving electrical continuity, shall be in accordance with 4.2.1 through 4.2.5.

4.2.1 General

This section covers the following topics:

a. Dissimilar Metals Compatibility Requirements

b. Methods of Bonding

c. Bonding Connection Installation Requirements

d. Hardware for Bonding Jumpers and Straps

4.2.1.1 [A1] Resistance of Bonds

Unless otherwise specified in this standard, bonds shall have a maximum direct current (dc) resistance of 1 mΩ when measured between the bonded components with a four-terminal milliohmmeter.

4.2.2 Dissimilar Metals

Bonding connections and associated fastener hardware for grounding system conductors shall comply with Table 1**.**

Table 1. Mechanical Bonds Between Dissimilar Metals

METAL	Copper, solid or plate	Brass and bronze	Stainless Steel	Tin-plate; tin-lead solder	Aluminum, wrought alloys of the 2000 Series	Iron, wrought, gray or malleable, plain carbon and low alloy steels	Aluminum, wrought alloys other than 2000 Series aluminum, cast alloys of the silicon type	Aluminum, cast alloys other than silicon type, plated and chromate	Galvanized steel	Zinc, wrought; zinc-base die-casting alloys; zinc plated
Copper, solid or plate	●●●	●●●	●●	●	●	●	No	No	No	No
Brass and bronze	●●●	●●●	●●	●●	●	●	●	No	No	No
Stainless Steel	●●	●●	●●●	●●●	●●●	●●	●	●	No	No
Tin-plate; tin-lead solder	●	●●	●●●	●●●	●●●	●●	●●	●	No	No
Aluminum, wrought alloys of the 2000 Series	●	●	●●●	●●●	●●●	●●●	●●●	●●	●	●
Iron, wrought, gray or malleable, plain carbon and low alloy steels	●	●	●●	●●	●●●	●●●	●●●	●●●	●	●
Aluminum, wrought alloys other than 2000 Series aluminum, cast alloys of the silicon type	No	●	●	●●	●●●	●●●	●●●	●●●	●	●
Aluminum, cast alloys other than silicon type, plated and chromate	No	No	●	●	●●	●●●	●●●	●●●	●●	●
Galvanized steel	No	No	No	No	●	●	●	●●	●●●	●●●
Zinc, wrought; zinc-based die-casting alloys; zinc plated	No	No	No	No	●	●	●	●	●●●	●●●

LEGEND: Four Basic Categories of Possible Metal Interfaces	
No	Not suitable. This interface is highly likely to result in significant corrosion.
●	Suitable for indoor environments where temperature and humidity are controlled (non-condensing environment).
●●	Suitable for all indoor environment.
●●●	Suitable for all environments.

4.2.3 Methods of Bonding

Direct bonding techniques include:

a. Exothermic Welds. Exothermic welds are permitted for any type of bond connection specified herein.

b. Hydraulically Crimped Terminations. Crimped terminations are permitted as an alternative technique to facilitate installation of connections in permanently concealed or inaccessible locations.

c. Welded Assemblies. Metal fabrication assembly process constructed by welding the joints between the individual components.

d. Mechanical Connections. Electrical bond connections constructed with bolted assemblies.

e. Brazing and Soldering. Metal-joining process formed by brazing or soldering a filler alloy metal is not permitted for bond connections.

f. Silver Soldering - Only Applicable for NAS Electronic Equipment. To improve conductivity, silver soft soldering material may be applied for the bonding of enclosure shielding joints already secured with mechanical fasteners. Mechanical fasteners shall be attached prior to application of solder to prevent cold solder joints. Soft soldering techniques are not permitted as a method for providing mechanical restraint.

4.2.3.1 Exothermic Welds

Exothermic welded connections shall be provided for the following applications:

a. Permanent Bonding. Permanent bonding of copper conductors to metal assemblies or building steel.

b. Underground or Buried Locations.

c. Exposed Exterior Locations. Any exposed location where an exothermic weld connection is possible.

d. Permanently Concealed Locations. Locations where the connection will be permanently concealed after completion of fabrication or building construction process.

e. Inaccessible Locations. Locations rendered inaccessible due to a building feature or other physical constraint that restricts routine access necessary to perform maintenance and visual inspection.

Exception. *Where exothermic welds are not possible due to dissimilar materials, incompatible shapes, voiding of a manufactured finish warranty, or in hazardous locations, such as near fuel tanks or other combustible material, provide UL listed hydraulically crimped or mechanical connections.*

4.2.3.1.1 Exothermic Welds – Installation within Existing Facilities

The following measures shall be taken in the installation of exothermic welds within existing facilities:

a. Where combustion from the use of a standard exothermic weld process would result in problems within the facility, a smokeless type exothermic weld process shall be provided.

b. After completing the welding process, to prevent corrosion, remove or neutralize residual fluxes between components.

4.2.3.2 Hydraulically Crimped Terminations

A UL 467 and UL 96 listed irreversible compression type bonding connection is permitted for use within concealed and inaccessible locations.

a. Bonding Conductors. Bonding conductors shall be wire size 6 AWG or larger.

b. Hydraulic Compression Tool System. Hydraulic compression tool system shall be capable of producing a 12-ton minimum force applied with a tool using matching dies.

4.2.3.3 Welded Assemblies

Individual components of a welded assembly shall not require additional bonds between components if the dc resistance between individual components is less than 1 mΩ.

4.2.3.4 Mechanical Bolted Bond Connections

Mechanical bolted bond connections shall be prepared and completed in accordance with the installation conditions and requirements provided herein.

4.2.3.4.1 [A2] Coupling of Dissimilar Metals

Compression bonding with bolts and clamps shall comply with Table 1. When dissimilar base metals form couples that are not permitted per Table 1, the metals shall be coated, plated, or otherwise protected with a conductive finish.

4.2.3.4.2 Bolted Connections

Bonding bolts shall be used primarily as mechanical fasteners to hold electrical bonding components in place. Tighten bolts sufficiently to achieve adequate contact pressures for effective bonding, but do not overtighten them to the extent that deformation of bond members occurs. To prevent loosening of the connection, provide disc springs for connections using bolts 1/4-in. diameter and greater.

a. Torque Requirements. Bolted connections 1/4-in. diameter and greater shall conform to the torque requirements in Table 2.

b. Bolts, Nuts and Washers. Bolted connections in corrosive, damp, or wet locations, 1/4-in. diameter and greater, shall utilize stainless steel type 18-8 bolts, nuts, and load distribution washers. All other locations shall use corrosion-inhibited SAE Standard J429 Grade 5 nuts and bolts. Load distribution washers shall comply with ANSI B18.22.1 for stainless steel washers, Wide Series, Type B.

c. Assembly. Bolted connections 1/4-in. diameter and greater shall be assembled in the order shown in Figure 1. Additional load distribution washers, if used, shall be positioned directly beneath the bolt head. Disc springs shall be between the nut and the

load distribution washer. Washers shall not be placed between bonded members. Load distribution washers shall be Wide Series, Type B.

d. Termination Lugs. Provide 2-hole termination lugs for connections to ground plates. Provide 2-hole termination lug connections to equipment metal members for conductors size 6 AWG and larger. If the equipment metal members do not allow modification for installation of 2-hole lug terminations, then 1-hole termination lugs are permitted.

4.2.3.4.2.1 Sheet Metal Screws

Sheet metal screws shall not be used to provide an electrical bond.

4.2.3.4.2.2 Self-drilling and Self-tapping Screw Fasteners

Self-drilling and self-tapping metal screws are permitted to make a physical connection between metal back panels within equipment cabinet/enclosures when access to the opposite side of the bond is not available using other bonding methods.

4.2.3.4.3 Riveting

Rivets shall be employed solely as mechanical fasteners to hold multiple smooth, clean metal surfaces together or to provide a mechanical load-bearing capability to a soldered bond.

Table 2. Connection Torque Requirements for Bolted Bonds

Bolt Specification for Stainless Steel 301 Type SS 18-8						
Bolt diam. (in.)	**Threads per inch**	**Torque (ft-lbs) SS 18-8**	**Bolt Clamp Load (lbs.)**	**Flat Load (lbs.)**	**Washers Required** (see note 2)	**Solon Part Number** (see note 1)
1/4	20	6	1,510	600	3	4-L-42-301
5/16	18	11	2,120	1,000	3	5-L-52-301
3/8	16	19	3,150	2,100	2	6-M-80-301
7/16	14	31	4,300	N/A	N/A	N/A
1/2	13	43	5,170	3,300	2	8-L-90-301
9/16	12	56	6,070	2,800	3	9-L-89-301
5/8	11	92	8,880	5,500	2	10-20-125-301
3/4	10	127	10,200	13,800	1	12-EH-168-177
7/8	9	194	13,310	14,400	1	14-H-168-177
1	8	286	17,200	14,200	2	16-H-187-177
Bolt Specification for SAE J429 Type Grade 5						
Bolt diam. (in.)	**Threads per inch**	**Torque (ft-lbs) Grade 5**	**Bolt Clamp Load (lbs.)**	**Flat Load (lbs.)**	**Washers Required** (see note 2)	**Rolex-Fastenal Part Number** (see note 1)
1/4	20	10	2,500	1,390	2	0124030
5/16	18	21	4,000	5,345	1	0124033
3/8	16	34	5,500	8,000	1	0124035
7/16	14	55	7,500	N/A	N/A	N/A
1/2	13	83	10,000	9,900	2	0124037
9/16	12	117	12,500	12,000	2	0124039
5/8	11	167	16,000	13,000	2	0124041
3/4	10	288	23,000	31,000	1	0124043
7/8	9	452	31,000	40,276	1	0124044
1	8	567	40,000	46,000	1	0124046

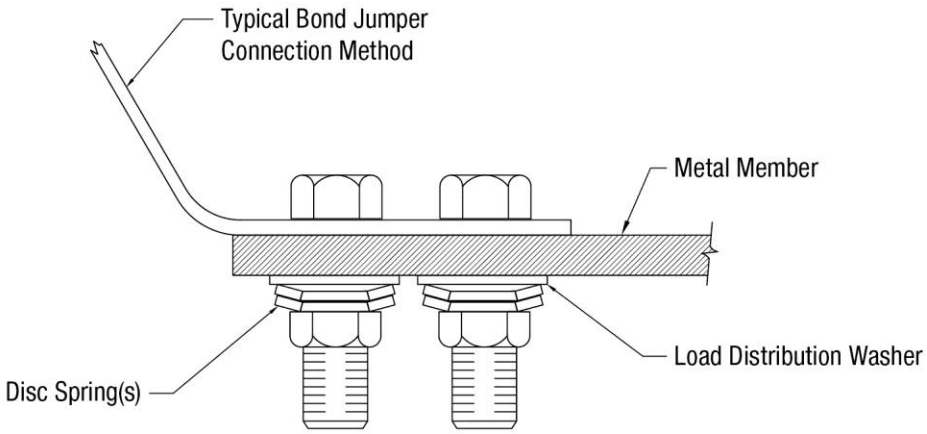
Notes:

1. Other manufacturers of disc spring washers of equal or better performance are permissible. Use bolt assembly manufacturer's recommended torque values.

2. The sum of the individual disc washer flat load ratings shall exceed the listed bolt clamp load. The number of washers required is calculated by the following formula:

$$B_{\text{Bolt Clamp Load}} < W_{\text{Number of Washers}} \times F_{\text{Washer Flat Load}}$$

For example, a 1/4-in. stainless steel bolted connection requires minimum 1,510 lbs clamp load, therefore, 3 disc washers will be needed.



Notes:

1. Remove all paint on the entire bonding area of the metal member.
2. Stack disc spring washers to obtain required amount per Table 2.
3. Provide 2-hole termination lugs for connections to ground plates.

Figure 1. Order of Assembly for Bolted Connections

4.2.4 Bonding Connections – Installation Requirements

Bonding connections shall be prepared and completed in accordance with the installation conditions and requirements provided herein.

4.2.4.1 Surface Preparation

Bonding surfaces shall be cleaned thoroughly and free of dirt, dust, grease, oxides, nonconductive films, and foreign material. Paint and other coatings at the location shall be removed to expose the base metal.

a. Surface Area To Be Cleaned. Clean mating surfaces at least 1/4-in. beyond each side of the smaller bonded area.

b. Clad Metals. Clean clad metal to a bright, shiny, smooth surface without penetrating the cladding. Wipe the cleaned area with solvent and allow the surface to air dry before completing the bond.

c. Aluminum Alloys. To create a bright finish after cleaning, apply a conductive coating with paint or resin finish to aluminum mating surfaces.

4.2.4.2 Completion of Bonding Connection

Clean surfaces with a solvent suitable for electrical work immediately prior to assembly. Mating surfaces shall be joined within 2 hours after cleaning if an intentional protective coating has been removed from the metal surface. If delays beyond 2 hours are necessary in corrosive environments, then the cleaned surfaces shall be protected with an appropriate coating that shall be removed prior to completion of the bond connection.

a. Refinishing of Bond. Areas around the bond connection shall be restored to match the original finish, unless not feasible.

b. Surface Plating or Treatments. Surface plating or treatments may be applied to the connection to improve abrasion resistance and corrosion protection, provided the treatment material enhances bond conductivity. Silver and other easily tarnished metals shall not be used to plate bonded surfaces, except where use of other metals may result in an unacceptable increase in surface contact resistance. In such cases, protect plating material by sealing exposed surfaces of the completed connection from the atmosphere.

4.2.4.3 Sealing and Finish Treatments for Bonding Connections

All bonds shall be protected against weather, corrosive atmospheres, vibration, and mechanical damage. Under dry conditions, apply a compatible corrosion preventive or sealant within 24 hours of assembly of the bond materials. Under conditions exceeding 60 percent humidity, seal the bond with a compatible corrosion preventive or sealant within 1 hour of joining.

Exterior bonds shall be protected against corrosion. Interior bonds exposed to moisture or high humidity shall be protected against corrosion.

a. Sealing Treatment for Corrosion Protection. Corrosion protection shall be provided by sealing the bond connection with a moistureproof paint conforming to FAA-STD-012 or with a silicone or petroleum based sealant to prevent moisture from reaching the bonding area. Bonds protected by conductive finishes such as alodine and iridite shall not require painting to meet the requirements of this standard.

b. Compression Bonds in Climatically Protected Areas. Sealing is not required for compression bonds between copper conductors or compatible aluminum alloys that are located in readily accessible areas that are not exposed to moisture, corrosive fumes, or excessive dust.

c. Painted Finishes. If a paint finish treatment is required on the final assembly, then the bond shall be sealed in accordance with the manufacturer's recommendation. To ensure the bond is completely sealed against moisture, a waterproof type of paint or primer shall be used if the recommended finish treatment is not waterproof.

4.2.5 Bonding Connections – Hardware for Bonding Jumpers and Straps

Bonding jumpers and straps shall be installed in accordance with the requirements provided herein.

4.2.5.1 Installation of Bonding Jumpers

Bonding jumpers shall be insulated conductors, except as noted herein.

Bare conductors shall be used for the following applications:

a. Raised access floor installations.

b. Jumpers for structural steel or rebar connected to the EES, lightning protection systems, and plenums or environmental air spaces.

c. Jumpers too short to be insulated or where required by NEC.

4.2.5.2 Installation of Bonding Straps

Bonding straps for bonding of electronic equipment shall be as short as possible. Herein, bonding straps are expected to be bare.

Bonding straps shall conform to the following:

a. Bonding straps shall be attached to the integral structural frame portion of the cabinet/enclosure rather than through adjacent parts to achieve optimal electrical connection.

b. Bonding straps shall be installed so that the electrical bond is not affected by motion or vibration.

c. Bonding straps shall be installed wherever possible in areas accessible for maintenance and inspection.

d. Bonding straps shall be installed to allow movement of the components being bonded or other adjacent components intended to move as part of normal functional operation.

e. Two or more bonding straps shall not be connected in series to provide a single bonding path.

f. The method of installation and point of attachment of bonding straps shall not weaken the components to which they are attached.

g. Bonding straps shall not be compression fastened through nonmetallic material.

h. Bonding installed across shock mounts or other suspension/support devices shall not restrict the performance of the mounting device. Bonding connections shall be capable of withstanding anticipated motion and vibration of supports without suffering metal fatigue, loosening of ground connections, or other degradation.

4.2.5.3 Fastener Hardware

Fastener materials for attachment of bonding straps and jumpers to structures shall conform to materials listed in Table 1.

4.2.5.4 Temporary Bonding Connections

Alligator clips or spring-loaded clamping products are permitted only for the purpose of establishing a temporary bond connection while performing repair work on equipment or facility wiring.

4.3 Lightning Protection System Requirements

4.3.1 General

The purpose of the lightning protection system is to provide preferred paths for lightning discharges to enter or leave the earth without causing damage to facility or equipment or injury to personnel. The essential components of a lightning protection system are air terminals and roof and down conductors connecting to the EES, the EES, and SPDs. These components act together as a system to dissipate lightning energy. The lightning protection system shall meet or exceed the requirements of FAA standards and orders as specified herein and the following:

a. Standard for the Installation of Lightning Protection Systems (NFPA 780)

b. Installation Requirements for Lightning Protection Systems (UL 96A)

The risk assessment guide in NFPA 780 indicates that many NAS facilities have a high risk index. Accordingly, lightning protection requirements that exceed the minimum requirements of NFPA 780 are specified herein. Inclusion of a UL Master label is not sufficient to indicate compliance with this standard.

a. ATCT Special Requirements. See section 5.2 for Airport Traffic Control Tower (ATCT) special requirements.

b. Other Special Conditions. See section 5.3 for other lightning protection system special conditions.

4.3.2 Lightning Protection System – Components

Products shall be UL listed and labeled with the UL certification mark in accordance with UL requirements. All equipment shall be new and of adequate design and construction to suit the application in accordance with UL 96A requirements. Provide copper or tinned copper cable materials. Aluminum cables shall only be used on aluminum and galvanized surfaces. Bimetallic connectors shall be used for interconnecting copper and aluminum conductors. Dissimilar materials shall conform to the bonding requirements of paragraph 4.2.2.

4.3.3 Lightning Protection System – Material Class Requirements

The FAA has opted to exceed minimum NFPA 780 cable sizing requirements. Provide Class II or larger rated materials, as specified in NFPA 780, for the following:

a. Air Terminals

b. Main and Down Conductors

c. Bonding Conductors

4.3.4 Lightning Protection for NAS Facilities Buildings and Structures

Lightning protection shall be provided for buildings and structures, or parts thereof that are not within the zone of protection provided by another building, higher part of a building, an antenna, or a tower. The zone of protection scheme for all structures shall be as defined in NFPA 780.

4.3.4.1 Number of External Down Conductors for Buildings

The number of down conductors shall be based on both the building height and perimeter.

a. Buildings and Structures Less Than 60 ft High Above Grade. These buildings and structures measured to the highest point of the building or structure shall have at least two down conductors.

b. Buildings and Structures More Than 60 ft High. See section 5.2.2.

c. Buildings and Structures with Perimeters in Excess of 250 ft. These buildings and structures shall have one additional down conductor for each 100 ft of perimeter distance or part thereof. Down conductors shall be as widely separated as possible, e.g., at diagonally opposite corners on square or rectangular buildings.

4.3.4.2 Metal Parts of Buildings

Building steel, metal roofing, metal supporting structures, concrete reinforcing steel, siding, eave troughs, down spouts, ladders, duct, and similar metal parts shall not be used as substitutes for roof or down conductors. A lightning protection system shall be applied to the metal roof and metal siding of a metal clad building in the same manner as on a building without metal covering. Building metal parts shall be bonded in accordance with paragraph 4.3.8.

Exception. *See paragraph 5.2.2.3*b *for ATCT lightning protection system design requirements.*

4.3.4.3 Roof-Mounted Antenna Masts

Unless it is a radiating or receiving part of the antenna, the metallic mast of a roof-mounted antenna shall be bonded to the nearest main roof conductor or down conductor.

a. If a main roof conductor or down conductor is not available where an antenna is installed on top of an ATCT, then bond the antenna mast to building steel in lieu of the EES. Reinforcing bars shall not be used in lieu of building steel.

b. If an antenna is installed on top of a building or base building, and the path is longer than a tenth of the difference between building steel and the EES (i.e. building steel is 5 feet away and the EES is more than 50 feet away), then bond the antenna mast to building steel. Reinforcing bars shall not be used in lieu of building steel.

4.3.5 Lightning Protection System - Conductor Routing

Down conductors shall follow the most direct downward path to earth. Main and bonding conductors shall maintain a downward or horizontal course, and are permitted to rise at no greater than a 1 to 4 slope.

a. Conductor Bends. Down conductors shall be installed without any sharp bends or kinks. No bend in a main and bonding conductor shall form an included angle of less than 90 degrees, nor shall it have a bend sweep radius of less than 8 in.

b. Conductor Connections. T-style and cross-over cable-to-cable connections between main conductors shall be in accordance with Figure 2.

c. Conductor Routing. Conductors shall be routed outside of structures and not penetrate structural cladding except as indicated in 5.2.2.3b. Conductors shall be routed 6 ft or more from power or signal conductors. If this clearance cannot be met, the power and signal conductors shall be routed in ferrous RGS conduit or enclosed ferrous cable tray.

d. Main Conductors. Main conductors shall be permitted to pass through elements of the building structure, e.g., parapets, eaves, walkways, walls, where necessary to maintain horizontal or downward course. Provide a 2-in., Schedule 80 rigid PVC conduit sleeve, or UL listed through-connector fitting at penetrations. When the conductor penetrates a metallic structure of any thickness, the conductor shall be bonded to the metallic structure. Conductors are permitted to pass through metal gratings or plates without a conduit sleeve; however, the conductor shall be bonded to the metallic structure.

4.3.5.1 Main and Down Conductor Terminations to EES

Conductor terminations to the EES shall be exothermically welded to a 4/0 AWG copper conductor prior to entering the ground at not less than 18 in. above grade. The 4/0 AWG copper conductor shall be bonded directly to a ground rod or electrode conductor in the EES. Exothermic weld connections to the EES shall be in accordance with Figure 3.

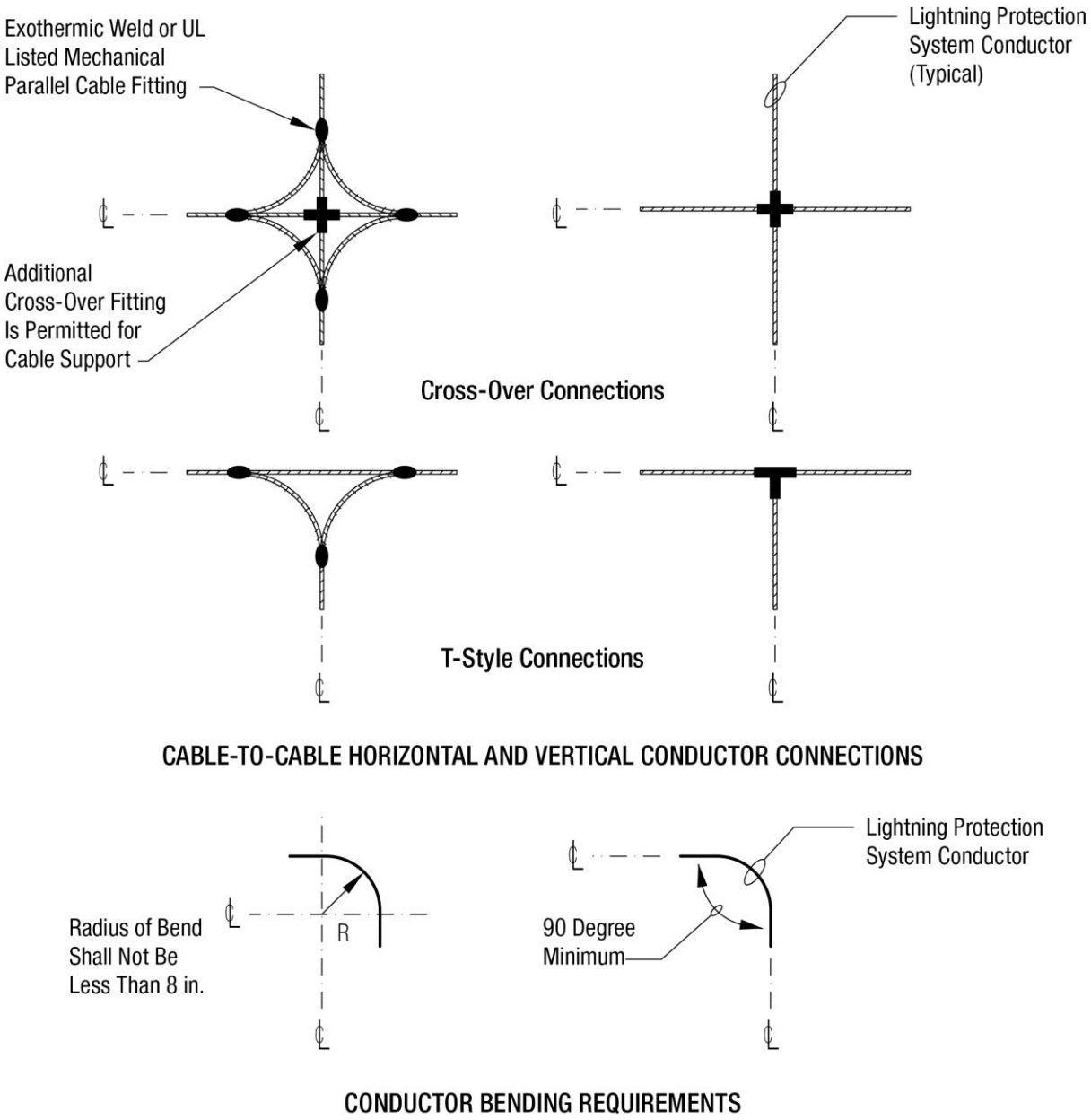
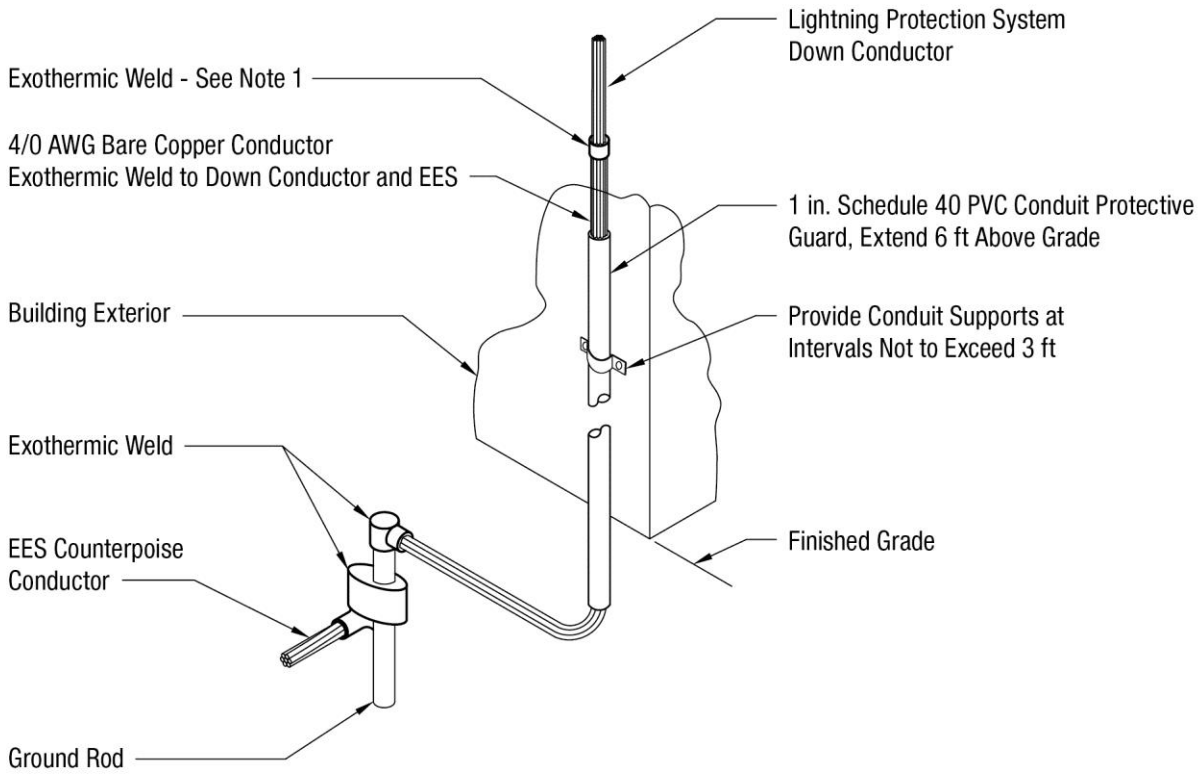


Figure 2. Lightning Protection System Main Conductor Connections – Illustrative Example



Note:

1. Locate exothermic weld above the conduit guard to ensure connection is available for visual inspection. When installation of the connection is not possible at top of conduit guard, locate the exothermic weld at least 18 in. above finished grade and provide guard system with pull box and removable cover that will permit visual inspection of the weld connection.

Figure 3. Main and Down Conductor Termination to EES – Illustrative Example

4.3.6 Lightning Protection System - Air Terminals

Air terminals shall be solid copper, bronze, or aluminum. Air terminals shall be stainless steel in areas of high potential for corrosion. Copper air terminals shall be allowed to have nickel plating. Air terminals shall be 12-in. high minimum, with a diameter of at least 1/2-in. for copper and 5/8-in. for aluminum, and have sharp, blunt or approved protective style tip. Air terminals shall be located and installed in accordance with NFPA 780 and UL 96A, and as required herein. Closer spacing is permitted for unique geometries. Air terminals shall extend at least 10-in. above the object or area it is to protect.

Air terminals located near working or walking surfaces may present an impalement hazard to personnel. The impalement protection design may be accomplished through use of air terminal selection, air terminal mounting type, mounting height, or a combination thereof. If mounting height is selected to mitigate the impalement hazard, the top of the air terminal shall not be less than 5-ft above the adjacent walking surface. If it is not feasible to install the air terminal on the

object, locate air terminals next to the object to achieve this requirement, and bond the metallic object to the lightning protection system.

4.3.6.1 Mast Poles Used For Air Terminal Installation

Air terminals installed on mast poles shall be at least 2 ft tall and extend a minimum of 10 in. above the top of the mast pole. Provide a down conductor installed on the exterior of the mast pole. Air terminal and down conductor shall be fastened to the pole in accordance with NFPA 780. Connect air terminal to the nearest main roof conductor or down conductor. If a roof or down conductor is not available, bond directly to the EES.

4.3.7 Lightning Protection System - Hardware

Lightning protection system hardware and installation shall be prepared and completed in accordance with the installation conditions and requirements provided herein.

4.3.7.1 Fastener Hardware

Provide conductor fasteners at intervals in accordance with NFPA 780. Provide fastener material using the same base material as the system conductor, or a material equally resistant to corrosion as the system conductor.

a. Plastic, Galvanized, or Plated Materials. Not permitted.

b. Fasteners. Where fasteners are part of a bonding connection component, the bonding surface shall be prepared and protected in accordance with paragraph 4.2.4. Cable holders that do not have mechanical support such as products with fold-over or break-away tabs shall not be used.

4.3.7.2 Terminations and Fittings

The preferred method for conductor connections and terminations is by exothermic welding. Where mechanical bolted pressure termination fittings are used the bonding devices, conductor splices, conductor terminations, and connectors shall be compatible with the installed conductor. Provide stainless steel, copper, bronze, or aluminum termination materials in accordance with the following:

a. Materials. Fitting material shall be suitable for use with the system conductor.

b. Straight and 90 Degree Through-Connectors. UL listed straight and 90 degree through-connectors are permitted to facilitate horizontal and vertical routing of system conductors.

4.3.7.3 Conductor Protective Guards

Provide protective guards for system down conductors located in or next to driveways, walkways, or other areas where they are subject to damage or displacement.

a. Nonmetallic Guards. Provide nonmetallic conductor guards, schedule 40 polyvinyl chloride (PVC) conduit or equivalent.

b. Guard Installation. Install guard from 1 ft below grade level extending to 6 ft above grade. When the roof or roof soffit construction is within 2 ft of the guard, the protective guard may be lowered to facilitate termination of the down conductor.

Exception. *Metal guards are permitted in lieu of nonmetallic material; however, metal guards shall be bonded to the down conductors at both ends of the guard. Provide bonding conductor size equal to the down conductor size.*

4.3.8 Lightning Protection System – Bonding Connections

Bonding connections shall be prepared and completed in accordance with the installation conditions and requirements provided herein. Provide exothermic welds for conductor connections to the EES.

4.3.8.1 Metallic Bodies Subject to Direct Lightning Strikes

Metallic bodies and assemblies that protrude beyond the zone of protection provided by the installed air terminals are subject to direct lightning strikes. This includes but is not limited to roof drains, gutters, vents, canopies, electrical raceway and fixtures, pipes, exhaust fans, metal cooling towers, HVAC units, ladders, railings, antennas, structures with metal louvers, etc.

Provide lightning protection for metallic bodies and assemblies for the following conditions:

a. Electrically Continuous Assemblies.

   1. Where metal thickness is 3/16 in. or greater, bond the assembly to the nearest lightning protection system main conductor. Provide fitting with bonding surface of at least 3 $in.^2$

   2. Where metal thickness is less than 3/16 in., install air terminals, main conductors, and fittings to provide at least two paths to ground from each air terminal device.

b. Not Electrically Continuous Assemblies. If the assembly consists of segmented parts and is not electrically continuous, then provide an additional main conductor interconnected to the nearest lightning protection system. Bond the individual metal parts. Provide at least two paths to ground.

4.3.8.2 Metallic Bodies Subject to Induced Charges

Metallic bodies that are subject to induced charges from lightning, including those in a zone of protection, shall be bonded to the lightning protection system in accordance with NFPA 780. This includes, but is not limited to, roof drains, vents, coping, flashing, gutters, downspouts, doors, door and window frames, balcony railing, conduits, and pipes, etc.

4.3.8.3 Metallic Bodies – Special Conditions

Metallic bodies located at grade or outside the lightning protection system's zone of protection may be bonded by direct connections to the EES.

4.3.8.3.1 Exhaust Stack Grounding

Fossil fuel exhaust stacks shall be bonded to the nearest lightning protection system main conductor or directly to the EES, using a bonding conductor of greater than or equal size as the main conductor. Provide exothermic weld or mechanical connection at exhaust stack, and exothermic weld at EES.

When the exhaust stack is located farther than 6 ft from a main conductor and, the exhaust stack shall be bonded directly to the EES.

4.3.8.3.2 Fuel and Oil Storage Tanks

Provide exothermic welds to bond tank vent piping and assemblies to the EES. Mechanical bonds may be used where required for dissimilar metals or component compatibility at the tank assembly. Bond tank vent piping and assemblies in accordance with following:

a. Above-Ground Nonpressurized Fuel and Oil Tank Vent Piping. Bond above-ground tank vent piping directly to the EES using a bonding conductor of greater than or equal size as the lightning protection system main conductor.

b. Above-Ground Tank Assemblies. Provide at least two easily accessible and widely separated grounding points for the tank assembly. Bond each grounding point directly to the EES using a 2/0 AWG conductor. Bond other metallic components, e.g., stairs, ladders, or skids, with a 2/0 AWG copper conductor.

c. Above Ground Pressurized Fuel Tanks. For pressurized fuel tanks, e.g., propane and compressed natural gas, provide at least one bond connection from tank mounting supports connected directly to the EES using a 2/0 AWG copper conductor.

d. Indoor Fuel and Oil Tank Vent Piping. Bond indoor mounted engine-generator day tank or other metallic fuel storage system vent piping mounted on the building exterior in accordance with NFPA 780.

e. Secondary Containment Systems. Secondary containment for fuel piping shall be bonded directly to the EES.

4.4 Earth Electrode System (EES)

4.4.1 General

An EES shall be installed at each facility to provide a common point of reference for all grounded systems at the facility. The EES establishes a low resistance to earth for lightning discharges, electrical and electronic equipment grounding, and surge/transient protection. The EES shall be capable of dissipating within the earth the energy of direct lightning strikes with no ensuing degradation to the system itself. The EES shall dissipate dc, ac, and radio frequency currents from equipment and facility grounding conductors.

4.4.2 [A3] Site Survey and Geotechnical Investigation

A subsurface geotechnical investigation shall be required to establish the design approach and parameters for new building construction to determine soil composition and resistivity characteristics. Information to be collected shall include location of rock formations, gravel deposits, soil types and classifications, and moisture content. The survey data shall be noted on a scaled drawing or sketch of the site, and documented in the Facility Reference Data File (FRDF). Soil resistivity testing shall be in accordance with FAA-HDBK-010.

4.4.3 EES – Design

The EES normally consists of driven ground rods, buried interconnecting conductors, and connections to underground metallic pipes, excluding gas lines and fuel tanks. The site survey and geotechnical investigation shall be used as the basis for the design of new buildings. The design objective for the EES resistance to earth shall be as low as possible, but shall not be greater than 10 Ω. Where "poor soil" conditions are encountered such as surface rock, shallow soils, permafrost, soils with low moisture, or high mineral content, then grounding enhancement methods listed in paragraph 4.4.5 shall be considered.

4.4.4 EES - Configuration

The EES shall consist of a continuous buried counterpoise conductor loop that extends around the entire perimeter of the facility or building structures. Provide ground rods interconnected along the counterpoise loop, spaced at least one ground rod length apart. Refer to FAA-HDBK-010 for design considerations.

For sites comprising multiple building structures, such as a building and antenna tower, configure the EES based on the following facility separations:

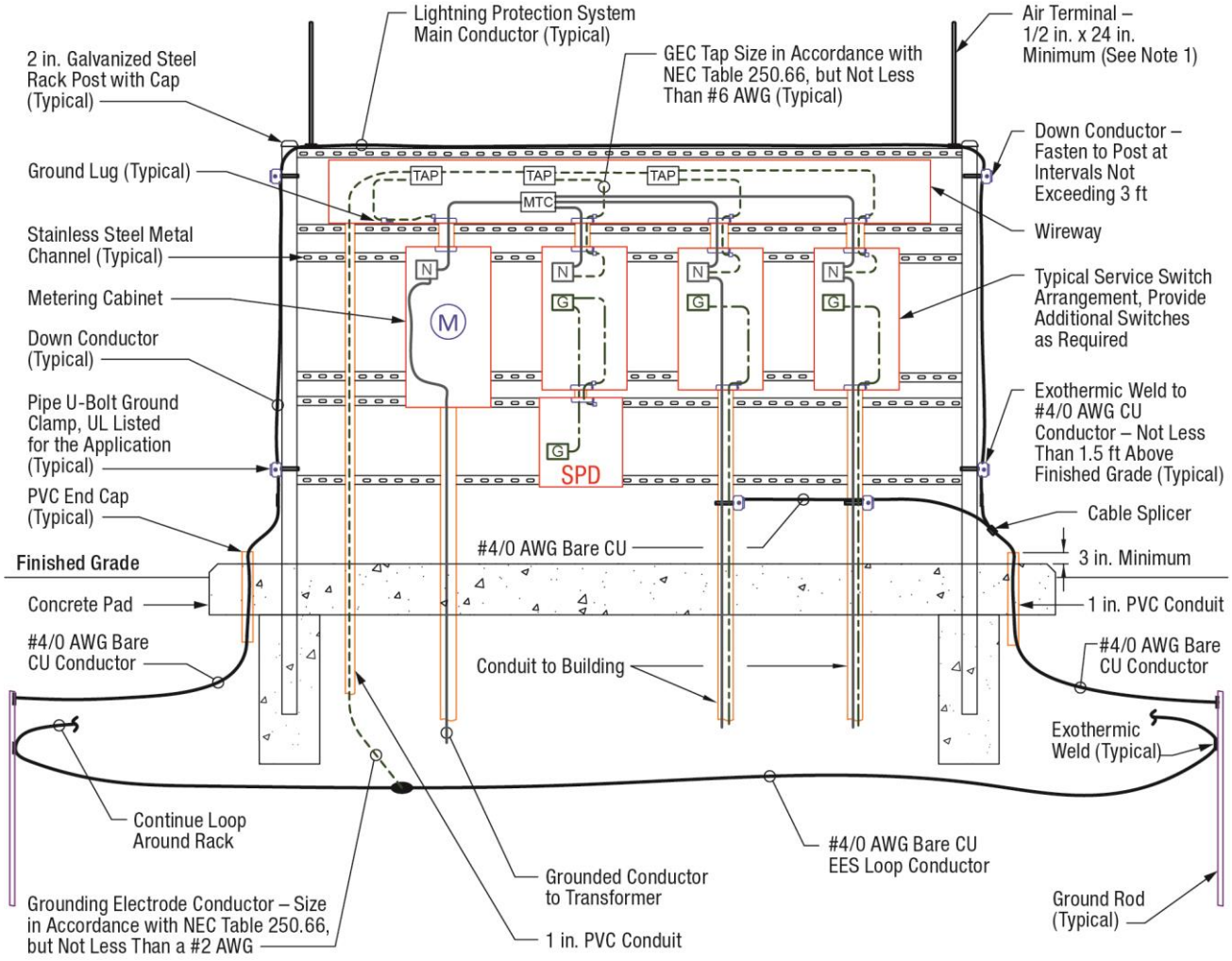
a. Less than 15 ft. A single EES loop designed to encircle the adjacent facilities is permitted.

b. Greater than 15 ft but Less than 30 ft. Design a separate EES for each facility, where adjacent EES loops may share a common side.

c. Greater than 30 ft but Less than 100 ft. Design a separate EES loop for each facility. Interconnect all EES loops by a minimum of two buried conductors, separated as widely as possible.

d. Greater than 100 ft. Design a separate EES for each facility. Interconnection of the separate EES is not required.

For small facilities, such as airfield navigation aids (NAVAIDS) or outdoor equipment service racks illustrated in Figure 4, an alternative EES design consisting of a minimum of two ground rods with a 4/0 AWG interconnecting ground wire is permitted.



Notes:

1. Only one air terminal, mounted at the center of the rack, is required for racks less than 6 ft in width.
2. Drawing is diagrammatic, phase conductors are not shown for illustrative purposes.

Figure 4. Typical Service Rack EES Installation – For Illustrative Purposes Only

4.4.4.1 Ground rods

Installation of ground rods shall meet the following requirements:

a. Material and Size. Ground rods shall be copper or copper clad steel, a minimum of 10 ft long and 3/4 in. diameter. Rod cladding shall not be less than 1/100 in. thick.

b. Spacing. Ground rods shall be as widely spaced as possible, and in no case spaced less than one rod length. Nominal spacing between ground rods is between two and three times the rod length.

c. Depth of Rods. Install top of ground rods at least 1 ft below grade level, or 1 ft below frost depth if required to suit climatic conditions.

d. Location. Rods shall be located 2 to 6 feet beyond the foundation or exterior footing of the structure, except at locations where abutting sidewalks, equipment, or other obstructions warrant locating rods farther away from the foundation. On buildings with overhangs or sidewalks in close proximity, then the ground rods are permitted to be placed at locations further out.

e. Orientation. Ground rods shall be driven at 90 degree (vertical) orientation to finish grade. If ground rods cannot be driven vertically to their full length, then the installation of grounding dissipation plates needs to be considered.

4.4.4.2 Interconnections

The EES installation shall include the following:

a. Counterpoise Loop. Ground rods shall be interconnected by a direct buried, bare 4/0 AWG copper conductor installed at least 2 ft below grade. Locate the counterpoise conductor and ground rods below the minimum frost depth. The interconnecting conductor shall close on itself forming a complete loop with the ends exothermically welded. Locate the counterpoise conductor and ground rods below the minimum frost depth with the exception of permafrost.

b. Exothermic Welds. Provide exothermic weld connections, except where prohibited by the NEC and at locations where welding creates hazards, such as near fuel tanks. In these cases, connections shall be installed with hydraulically crimped terminations using 12-ton minimum force applied with a tool using matching dies.

c. Building Structural Steel. Building perimeter steel columns shall be bonded to the EES at spacing intervals of approximately every other column, but not more than 60-ft intervals.

d. Reinforced Concrete Structures. Bond reinforcement bars to the EES once every 60 linear feet along the building foundation perimeter with a minimum 4/0 AWG bare stranded copper conductor exothermically welded or by a hydraulically crimped termination.

e. Underground Metallic Structures. Bond underground metallic pipes and tanks, except where cathodic protection systems are used or where prohibited by the NEC, such as gas piping.

f. Telephone Ground. Where present, the ground shall be connected to the EES by a bare copper conductor not smaller than 2 AWG.

4.4.4.3 Ground Dissipation Plates

In shallow soil locations with limited surface space, ground dissipation plates are permitted in lieu of ground rods in the EES. In difficult soils/areas, a combination of trenches filled with metallurgical coke and ground dissipation plates is highly recommended.

Installation of ground dissipation plates shall meet the following requirements:

a. Dissipation Plate Surface Area. Ground dissipation plates have four times the surface area of one ground rod, 3/4 in. diameter and 10 ft long. Therefore, substitute one ground dissipation plate for four ground rods.

b. Material and Size. Plates shall be fabricated and installed in accordance with Figure 6.

c. Spacing. Nominal spacing is 100 ft between ground plates.

d. Depth of Plates. Install plates to the same depth or deeper than the interconnecting EES counterpoise conductor, but maintain a minimum of 1 ft of native soil above the upper edge of the plate.

e. Location. The plates shall be installed at the corners of the EES at the farthest accessible point from the facility to be protected.

f. Orientation. Plates should be installed in a vertical plane to take advantage of seasonal moisture and temperature changes in the soil.

4.4.4.4 [A4] Access Well

Access wells are permitted to enable inspection and maintenance activities. When installed, the well should be located at a ground rod in unpaved areas with access to open soil, to allow for inspection. The access well shall be made from concrete or other approved material, with a removable cover. The access well shall provide a 12-in. minimum radius clearance from the center of the ground rod to the inside wall of the access well.

4.4.5 Grounding Enhancement Materials for Earth Electrode System (EES) Installation

Enhancement materials and methods are listed in order of preference.

4.4.5.1 Metallurgical Coke

Metallurgical coke is a steelmaking byproduct material of coal-to-coke production. Metallurgical coke is environmentally safe, stable, and conductive even when completely dry or frozen, moisture independent, compactable and economical to install.

Normal installation is in a 1-ft square trench filled with metallurgical coke in an EES configuration with a continuous 4/0 AWG stranded copper conductor in the center of the material per Figure 5. The top of the metallurgical coke trench shall be covered by a minimum of 1 ft of native soil. Metallurgical coke shall contain no more than 1 percent sulfur by weight. Charcoal and/or petroleum-based coke breeze shall not be substituted for metallurgical coke derived from coal in coke ovens. Charcoal and petroleum coke typically contain high levels of sulfur, which in the presence of moisture will accelerate corrosion of the EES. Placement of the

trench is based on the geometry of the facility and the physical site location. Radial trenches with a center conductor can be used to enhance RF ground planes in communication facilities.

4.4.5.2 Engineered Soil Materials

Engineered soil materials are cements, soils, or clays treated with a variety of materials to enhance soil conductive properties. These materials may be used in bored holes for ground rod installations and in trenches for counterpoise conductors. These engineered soils can be a mixture of moisture-absorbing materials such as Bentonite or homogenous clays in combination with native soils and/or chemicals. Some engineered soil enhancements use cement-based materials, but should be avoided in areas subject to significant soil movement. Engineered soil should have a moisture content of greater than 14 percent to be effective.

4.4.5.3 Chemical Soil Enhancements

Chemical enhancements (doping) using materials such as mineral salts, Epsom salts, and sulfates, should only be used as a last resort to enhance soil conductive properties. These materials may be used in bored holes for ground rod installations and in trenches for counterpoise conductors. Chemical enhancement is dependent on soil moisture content and requires periodic (usually annual) re-treatment and continuous monitoring to be effective. The chemicals can leach into the surrounding soil and can be deposited into the water table.

4.4.5.4 Chemical Ground Rods.

Similar to chemical enhancements, chemical ground rods also require re-treatment and monitoring to ensure continuous effectiveness. Many of these systems require a drip irrigation system in dry soil conditions. Installation and periodic inspections shall be in accordance with manufacturer's instructions.

4.4.6 Installation of Earth Electrode Systems in Corrosive Soils

Careful consideration must be given to the installation of any grounding system in soils with corrosive elements. Two geological areas of known concern are the volcanic soils in Hawaii and Alaska. It is recommended that supplemental cathodic protection be applied to the grounding system at these locations. A buried steel plate acting as a sacrificial anode shall be connected to the EES by a 4/0 AWG stranded bare copper conductor. The 4/0 AWG conductor shall be exothermically welded to the EES and to the sacrificial plate. The conductor shall be welded to the center of the plate. The sacrificial plate shall be a minimum 2 ft by 2 ft by 1/2 in. thick, installed in a vertical orientation.

For enhanced performance in shallow soils, provide a ground dissipation plate design per paragraph 4.4.4.3 or equivalent. Provide sacrificial anodes in addition to these standard ground plates.

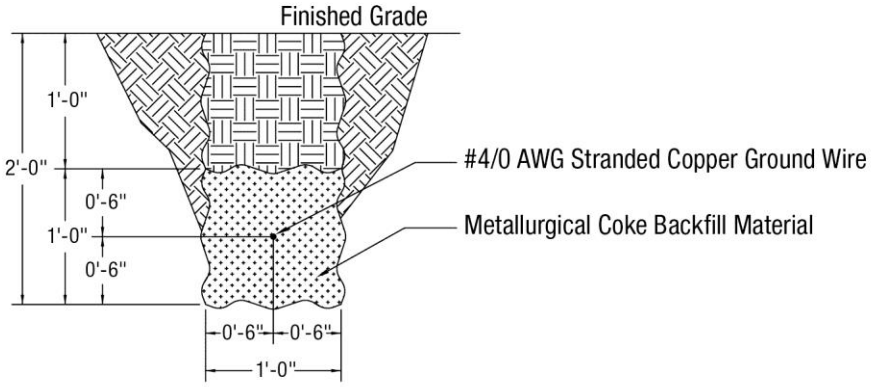


Figure 5. Grounding Trench Detail

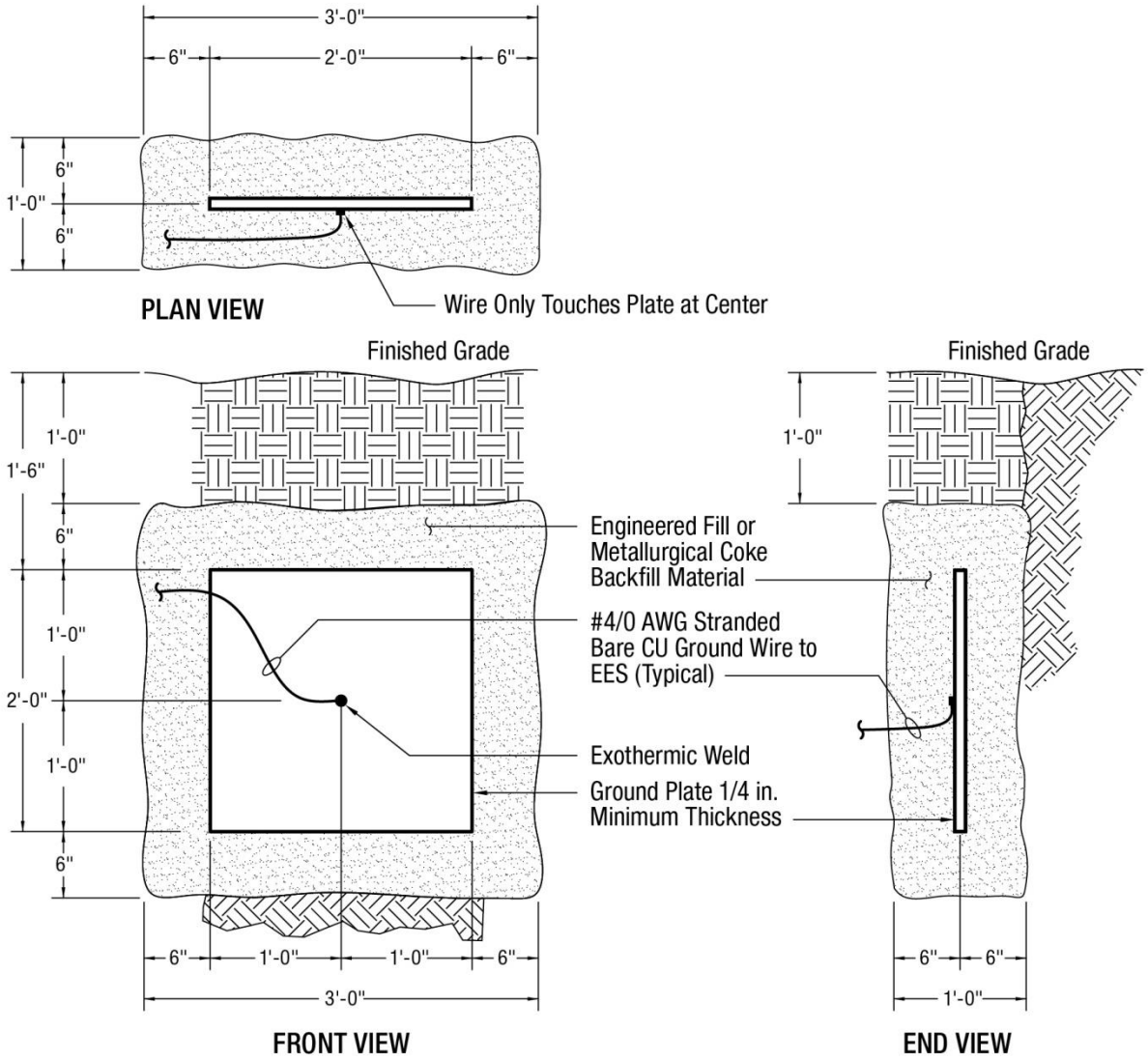


Figure 6. Ground Dissipation Plate Detail

4.5 National Electric Code - Power Distribution System Grounding Compliance

4.5.1 General

The facility electrical grounding shall exceed requirements of NEC Article 250 as specified herein.

4.5.2 Grounding Electrode Conductors (GEC)

Grounding electrode conductors (GEC) shall conform to the following:

a. GEC and Jumper Size. The GEC and system bonding jumper shall be sized in accordance with NEC Article 250.

b. GEC Termination and System Bonding Conductor. The GEC connection shall be terminated in the service disconnecting means (SDM). System bonding conductor shall be installed at the same location as the SDM.

c. GEC Splicing and Routing through Metal Enclosures. If the GEC is spliced using a hydraulically crimped connector, the connector shall comply with paragraph 4.2.3.2. When a GEC is routed through a metal enclosure, such as conduit, the enclosure shall be bonded with the same size conductor at each end to the GEC.

d. Separately Derived Systems. For a separately derived system, the system bonding jumper and the GEC shall be located at the first downstream system disconnecting means or overcurrent device. Connect the GEC directly to the EES, where possible, or terminate the GEC to the nearest effectively grounded structural steel member.

4.5.3 Equipment Grounding Conductors (EGC)

The EGC shall be a green insulated wire routed in the same raceway as the circuit phase and neutral conductors. Where power is supplied to electronic equipment through a cable and connector, the connector shall contain a pin to continue the EGC to the equipment chassis. Conduit or cable shields shall not be used as the sole EGC. Installation shall be in accordance with the NEC, FAA-C-1217, and the following:

a. Grounding Terminals in Receptacles on Multi-Outlet Assemblies. These terminals shall be hardwired to an EGC. Strips that depend on serrated or toothed fingers for grounding shall not be used.

b. Expansion joints. Conduit expansion joints shall be UL listed expansion joint fittings.

Where power conductors and the EGC are to be extended to a second building or structure, the neutral to ground bond of the power system shall originate at the first building electrical service entrance point. The grounded conductor shall not be connected to the EGC or EES at the second building or structure.

4.5.4 Grounding Bushings for Conduit Raceways

A grounding bushing is a conduit fitting that contains a lug for connecting a bonding jumper from the conduit bushing to the equipment ground bus or metal enclosure. This bonding jumper supplements the existing mechanical connection using locknuts and therefore improves the grounding integrity of the installation. The FAA has opted to exceed the minimum NEC raceway

grounding bushing installation requirements for power and communication distribution systems that serve NAS facilities.

Provide grounding bushings for conduit raceway systems for the following conditions:

a. IMC and RMC Conduits. A grounding bushing shall be installed on the interior threaded end of the conduit to protect conductor insulation (see Figure 7).

b. EMT Conduits. The connectors shall have an insulated throat, with a smooth bell shaped end or a grounding bushing.

c. Communication Conduit Pathways. Provide grounding bushings where conduits enter or leave the building. Additional grounding bushings are not required for electrically continuous conduit pathways located inside the building, unless otherwise required for electronic equipment operations. Bond each conduit with a 6 AWG or larger size conductor to the nearest SRS (with the exception of the single point ground system). If there are multiple conduits in the same junction box, the conduits can be bonded to a new ground bus established within the junction box with a 6 AWG or larger size conductor connected to the SRS (with the exception of the single point ground system).

Exception. *Pullboxes and junction boxes are exempt from the grounding bushing requirement unless required by NEC or equipment installation requirement.*

4.5.4.1 Non-Current-Carrying Metal Equipment Enclosures

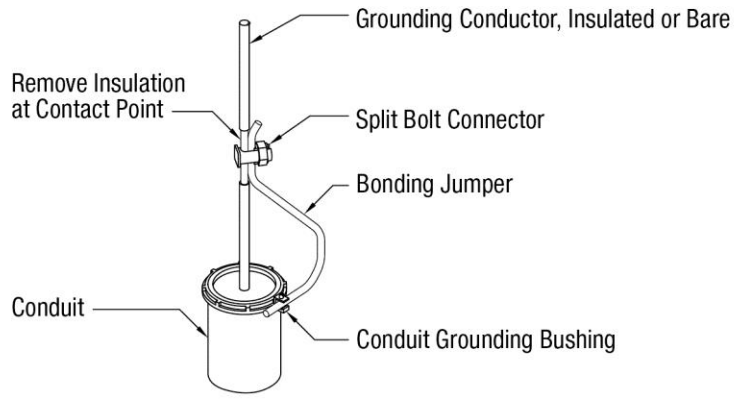
Non-current-carrying metal equipment enclosures include electrical equipment such as switchgear, panelboards, safety disconnect switches, raceways, and cable trays. The insulating finishes shall be removed between grounding and bonding areas of mating surfaces or bonding jumper connection points. The raceway systems shall be made electrically continuous in accordance with the following:

a. Noncontinuous Ferrous Conduit Pathways or Sleeves. Pathways used for routing conductors only shall be equipped with grounding bushings at each end of the conduit pathway. The grounding conductor shall be bonded to the bushings with a bonding jumper the same size as the grounding conductor, see Figure 7 illustrative example.

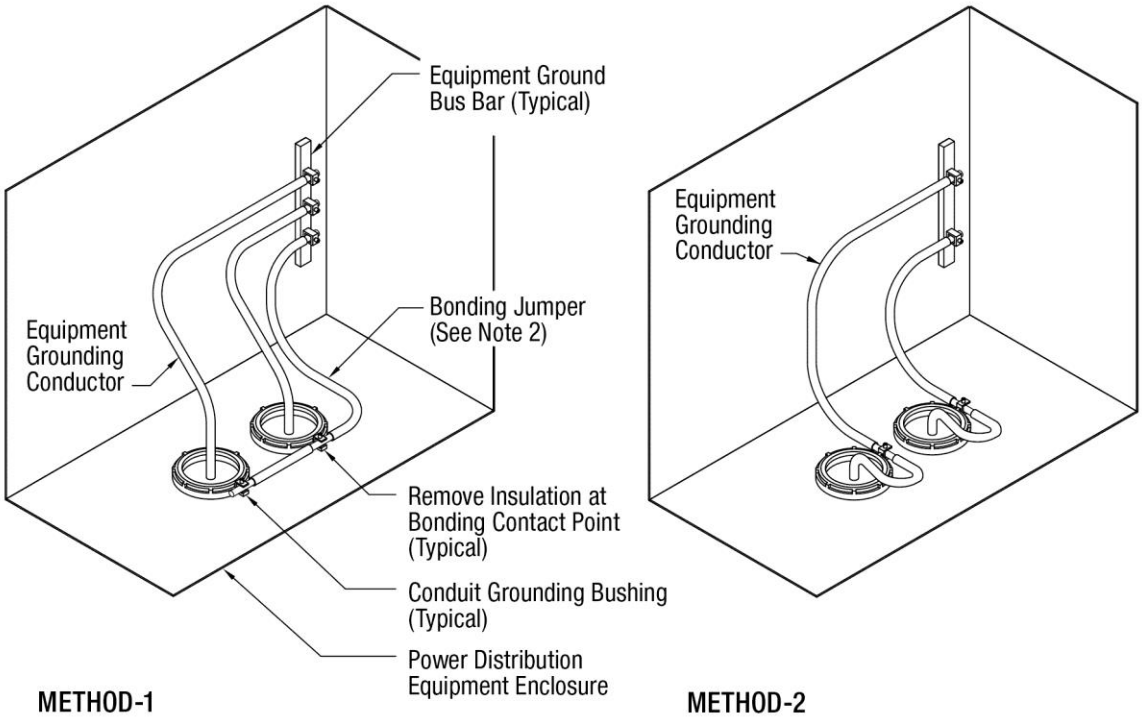
b. Continuous Conduit Systems. Systems that terminate at electrical equipment with grounding bushings as required in 4.5.4 shall be bonded to equipment ground bus with a bonding jumper the same size as the EGC. This shall be accomplished in accordance with Figure 7.

c. Ferrous Materials. These materials shall be used for enclosures, raceways, and cable trays when required to provide shielding from magnetic fields.

d. Battery Supporting Racks. These racks shall be bonded either directly to the EES or to a grounded structure with a minimum 2 AWG conductor.



ILLUSTRATIVE EXAMPLE: CONDUIT RACEWAY



METHOD-1 METHOD-2

ILLUSTRATIVE EXAMPLES: POWER DISTRIBUTION EQUIPMENT

Notes:

1. The illustrative examples depict typical bonding concept, other engineered solutions may be possible.
2. The bonding jumper shall be sized as large as the largest EGC going through the conduits being used for grounding bushings.

Figure 7. Bonding of Grounding Conductor to Conduit or Equipment

4.5.5 Interior Metal Piping Systems

Interior metal piping systems shall be bonded in accordance with the NEC.

Interior metal piping systems, such as mechanical and related metal piping systems located within the perimeter of SRS areas for NAS electronic equipment, shall be bonded in accordance with paragraph 4.7.3.2.

4.5.6 Building Structural Steel

Bonding of building structural steel elements shall be in accordance with the following:

a. NEC Compliance. At the electrical power service entrance and separately derived power source equipment, building structural steel shall be bonded in accordance with the NEC.

b. Periphery of NAS Equipment Room. Main building structural steel members of columns and beams at the periphery of NAS electronic equipment rooms shall be electrically continuous. This shall be accomplished by either direct or indirect bonding of the columns and beams. Where direct bonding is not practical, indirect bonds with copper conductor shall be used with a minimum of two 2 AWG conductors per 100 ft^2 of steel decking, metallic wall covering, etc. These connections shall be applied via an exothermic weld or a hydraulically crimped two-hole termination. Surface coatings shall be removed in accordance with paragraph 4.2.4.1**.**

c. Building Perimeter Steel. Building perimeter steel columns shall be bonded to the EES in accordance with paragraph 4.4.4.2c.

Exception. *Concrete-encased steel reinforcement used in precast construction elements is exempt from the bonding requirements.*

4.6 Surge Protection Device (SPD) Requirements

4.6.1 General

SPDs shall be provided at locations where electrical power systems are susceptible to conducted power line surges. SPD equipment functional performance requirements are detailed in section 5.7. Selection of appropriate SPD depends on location and application. The SPDs and transient suppression provided at electronic equipment power line entrances shall be coordinated as required herein and paragraph 5.6.4.

4.6.2 SPD for Power Distribution System

SPDs shall be provided at the following locations:

a. Service Disconnecting Means. Provide SPD on the load side of the SDM.

b. Facility Entrance Point. Provide SPD on the load side of a facility entrance point. For example, if the facility entrance point is within a NAS electronic equipment room, the SPD is required at the first distribution panelboard that supplies the branch panelboards within the room.

c. Transfer Switch, Switchboard, or Panelboard. Provide SPD either on the load side of an engine generator transfer switch, or on the first switchboard or distribution panelboard located downstream of the transfer switch.

d. Panelboards Feeding Building Exterior Loads. Provide SPDs at panelboards that supply branch circuit wiring exiting the building to serve exterior equipment.

e. Secondary Transformer. Provide SPD at separately derived power source that feeds NAS electronic equipment.

A lightning arrester shall be installed on the primary side of FAA-owned distribution transformers. Lightning arresters and SPDs shall be approved by the OPR.

4.6.2.1 SPD for Facility Entrance Equipment

SPDs shall be provided at the SDM, at all facility entrance penetrations, and at feeder and branch panelboards as specified in paragraph 4.6.2.2. Additional SPDs shall be provided at the power line entrances to operational electronic equipment.

4.6.2.2 SPD for Power Distribution Feeders and Panelboards

SPDs shall be installed on switchgear, panelboards, and disconnect switches providing service to NAS operational equipment or supplying exterior circuits.

Examples of exterior circuits include obstruction lights, convenience outlets, guard houses, security systems, electric gates, and feeds to other facilities.

Where feeder and branch panelboards are located close together and their panelboards do not serve exterior circuits, use the SPD location decision tree diagram, Figure 8, to determine if an SPD is required for branch panelboards. SPDs for panelboards that provide service to exterior circuits shall meet requirements of paragraphs 5.7.2.1.1, 5.7.2.1.2, and 5.7.2.1.3 for facility entrance SPDs.

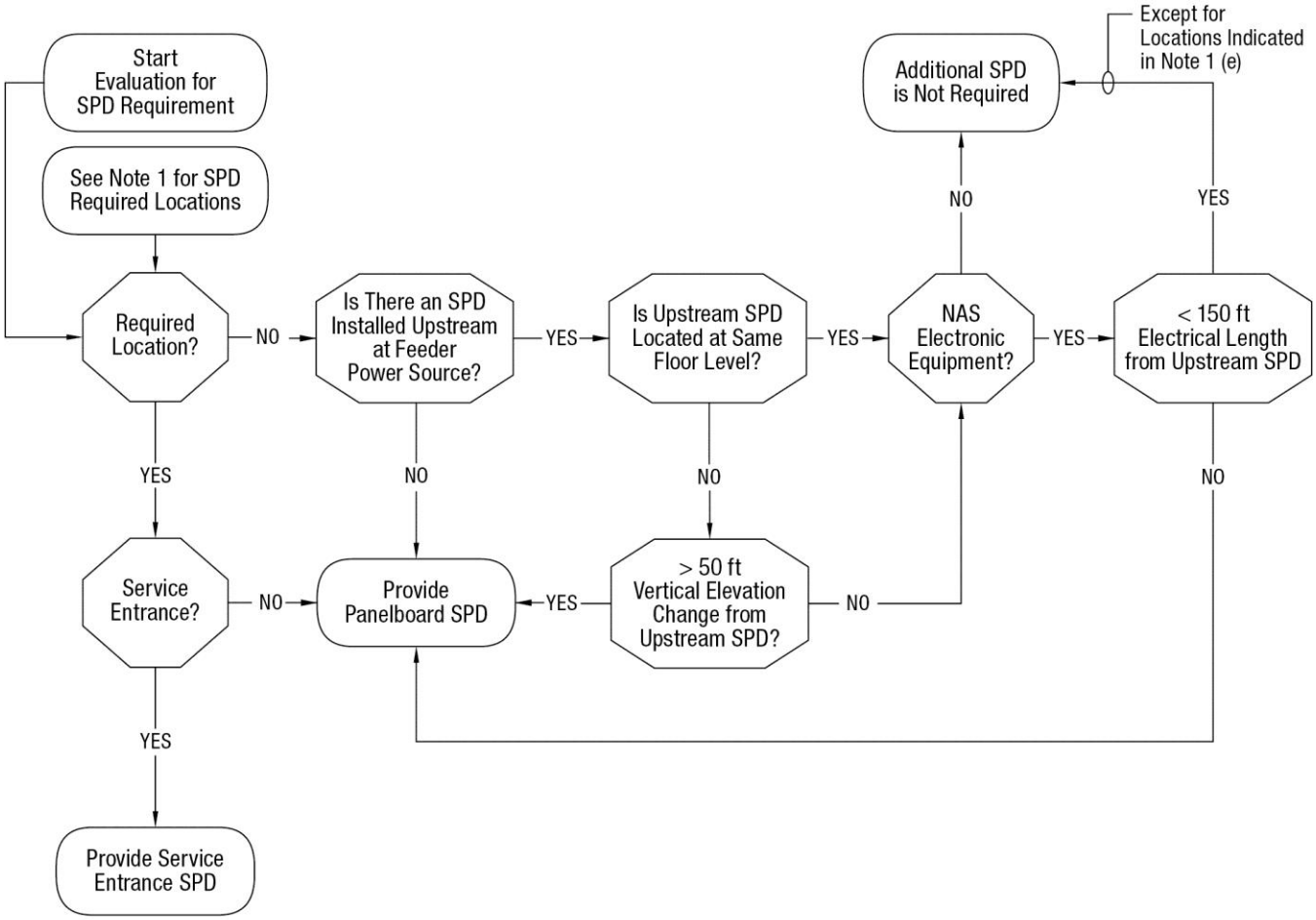
SPDs shall be installed as close as possible to the panelboard they serve and in accordance with the manufacturer's instructions. A feeder or branch panelboard SPD shall be provided with an overcurrent protection device. Overcurrent protective device (OCPD) examples include a fuse or circuit breaker fitted internal to the SPD or fitted to the panelboard and dedicated to the SPD. The overcurrent device shall not increase the clamp voltage of the SPD by more than 5 percent and shall pass the surge current values listed in Table 11 up to the 40 kA level without opening. Overcurrent devices for exterior circuits shall pass all surge current values in Table 11. Overcurrent devices, both internal and external to the SPD, and SPD short circuit current ratings, shall be sized and coordinated in accordance with the NEC and be field resettable or replaceable.

4.6.2.3 SPD Installation Requirements

SPDs shall be installed as close as possible to the panelboard or equipment that is being protected. Conductors shall be made as short as possible. Connections shall be made with UL listed connectors identified for the wire size and type used.

a. Connections. Install the maximum conductor size allowed by the SPD manufacturer, but do not exceed the incoming circuit phase and grounding conductor size permitted by the panelboard, SDM, or protected equipment. The SPD ground conductor does not need to exceed the size of the grounding electrode conductor. Conductors shall be color-coded in accordance with FAA-C-1217, and as short and direct as possible without loops, sharp bends, or kinks. The ground bus in the service entrance enclosure shall be bonded directly to the SPD terminal marked G or ground. The SPD enclosure shall be bonded to the SPD ground terminal.

b. Conduit Sealing. The conduit connecting the SPD enclosure to the SDM enclosure or panelboard shall be sealed with duct seal or other UL listed nonflammable, inorganic potting material to prevent soot from entering the protected enclosure in the event of SPD failure.



Notes:

1. Provide SPDs in accordance with paragraph 4.6.2 and for the following locations.
   a. Power service disconnecting means (SDM).
   b. Load side of automatic transfer switch (ATS).
   c. Transformer, secondary of separately derived power source.
   d. Panelboards with branch circuits that feed building exterior loads.
   e. Power feeder that supplies the panelboards for NAS electronic equipment room. SPD is required at the first panelboard located within the room.

Figure 8. SPD Location Diagram - Close Proximity Allowance Decision Tree

4.6.3 SPD for Signal, Control, and Data Line Surge Protection

Provide SPDs at the following locations:

a. Facility entrances,

b. Entrances to NAS electronic equipment (see paragraph 5.6.3),

c. Entrances to electronic equipment installed by the telecommunication service provider.

4.7 Grounding and Bonding for NAS Electronic Equipment Areas

4.7.1 General

This section describes grounding and bonding requirements for protection of NAS electronic equipment housed in designated NAS electronic equipment areas within FAA Facilities. Aspects of the grounding and bonding system include the following:

a. NAS Facilities Main Grounding Connection. This connection requires a main and supplemental ground plate, designed in accordance with paragraph 4.7.2. See paragraph 5.2.3 for ATCT facilities special requirements.

b. Signal Reference Structures. The SRS system requires grounding elements designed in accordance with paragraph 4.7.3.

4.7.2 Main and Supplemental Ground Plates

A main ground plate shall be established as a common point of connection for SRSs for the entire facility.

A supplemental ground plate shall be established at the opposite side of the facility to the main ground plate. This supplemental ground plate shall be used for a second connection of the multipoint ground system, signal reference grid, or signal reference plane to the EES. The use of multiple supplemental ground plates is permitted at large facilities.

Both the main ground plate and the supplemental ground plates shall conform to the following:

a. Located within 50 ft of the EES.

b. Each plate shall be connected to the EES with a 500 kcmil conductor.

c. Supplemental ground plates and the main ground plate shall be interconnected with an insulated 4/0 AWG cable, color coded with green and orange tracer.

See Table 4 for the main and supplemental ground plate installation requirements. See Figure 9 for typical facility grounding system.

Exception. *For buildings of 200 ft^2 or less, only the main ground plate is required. Connect the main ground plate to the EES with two 4/0 AWG stranded copper conductors. One of the conductors shall be 20 percent longer than the other. All signal grounding, single point or multipoint, shall terminate on this plate. No additional ground plates are required.*

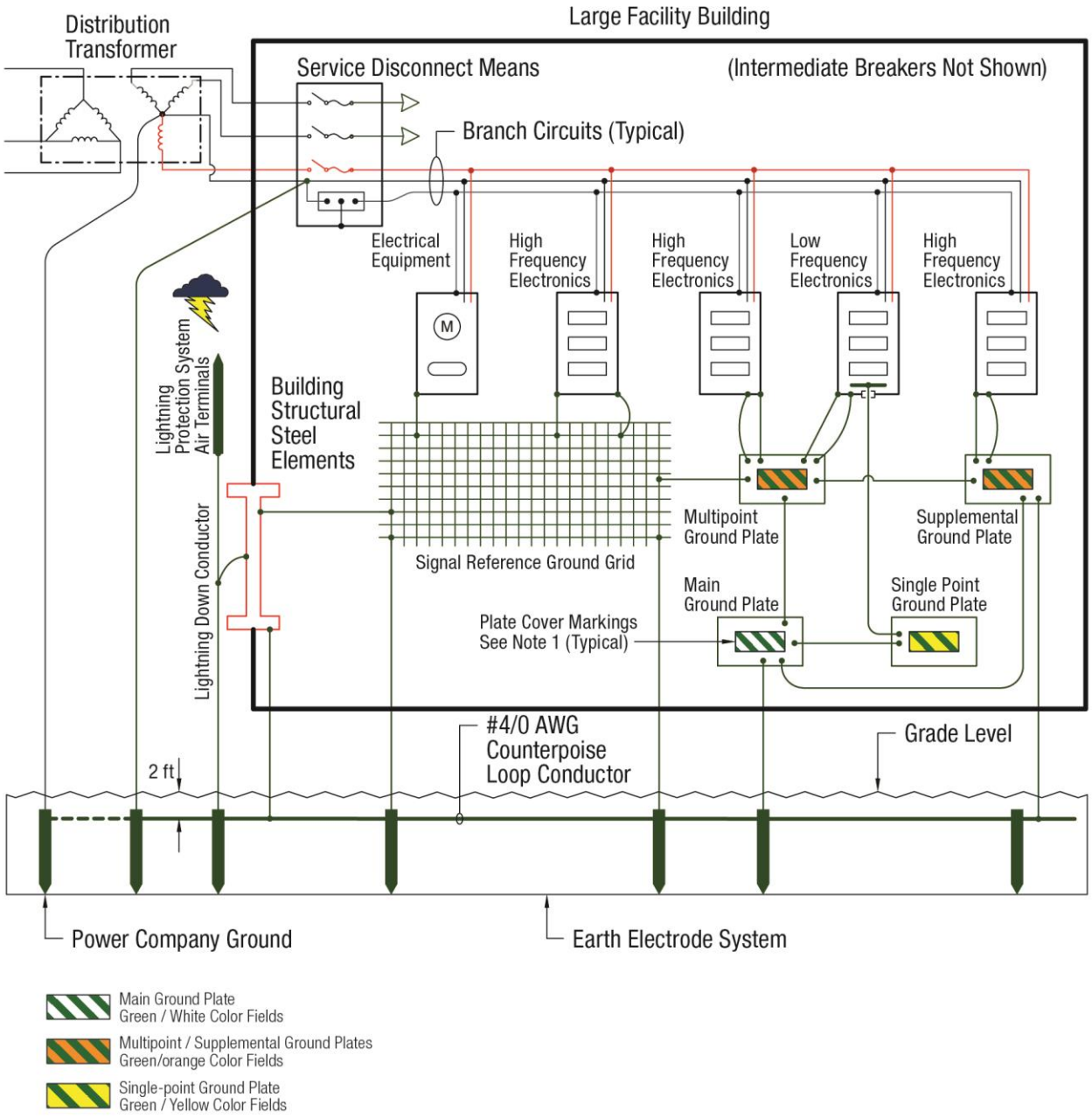


Figure 9. Typical Facility Grounding System

4.7.3 Signal Reference Structures (SRS) – Requirements

Enclosed building facilities used to house NAS electronic equipment shall be equipped with an SRS. Types of SRS include the following systems:

a. Multipoint Ground System (MPG) constructed using conductors and ground plates.

b. Signal Reference Ground Grid (SRGG) constructed using copper strips.

c. Signal Reference Ground Plane (SRGP) constructed using copper sheets.

d. Single Point Ground System (SPG) is a special grounding system defined in section 5.5. This topology shall only be installed as directed in section 5.5 and connected to the MPG, SRGG, or SRGP as directed in section 5.5, and it shall not be used as an applicable SRS as outlined in the rest of 4.7 and its sub-sections.

e. Engineered Hybrid System is a combination of MPG, SRGG, or SRGP grounding systems.

Provide an SRS for the following areas:

a. NAS Operations Areas. Entire room area.

b. Other Electronic Equipment Areas. Areas containing electronic equipment supporting NAS operations. Provide for the entire room area.

c. Other Power Conditioning Equipment Areas. Areas containing power conditioning equipment, such as site wide uninterruptible power supply (UPS), shall be bonded to the SRS system described above.

The above-referenced electronic and electrical equipment shall be bonded to the SRS in the area. SRSs located on the same floor or on different floors shall be bonded together using at least two separate paths. Multiple components of the facility SRS, but not the SPG system, shall be bonded together with a minimum of two 4/0 AWG conductors.

Design SRS systems for site-specific requirements of the facilities and equipment. SRS applications require analysis of equipment bandwidth, and equipment and SRS impedances. SRS analysis shall consider, among other parameters, operating frequencies and impedances, transmission line communication models for bonding wires, noise levels in low-frequency analog-based equipment, and the influence of high-frequency digital signal and logic equipment. All conductors and cabling of NAS electronic equipment systems operating nominally at a wavelength less than $\lambda/20$ of the highest system frequency shall lay on or very close to the SRS. Bonding connections between the electronic equipment and SRS shall be close-coupled so that the bonding jumpers are as short as possible, and routed to the nearest SRS connection point.

The SRS shall be located in the vicinity of the electronic equipment. Signal-carrying conductors, axial lines, waveguides, and cabling interconnections between equipment shall be routed in immediate proximity to the SRS. For overhead feeds, use overhead SRS systems. For underfloor feeds in raised access floors, use underfloor SRS systems. Where equipment is fed from both overhead and underfloor feeds, use a hybrid SRS system made up of MPG, SRGG or SRGP bonded together. MPGs, SRGGs, and SRGPs may be installed on ceilings, walls, or floors.

If NAS electronic equipment is installed in non-NAS electronic equipment rooms such as administrative areas, the NAS electronic equipment shall be bonded to a nearby SRS system. If there is no nearby SRS system, then establish a new MPG based on the footprint area of the NAS electronic equipment. If the square footage of the area is small enough, then install a small MPG system in accordance with paragraph 4.7.2.

The MPG and SRS systems shall be connected to the main and supplemental ground plates with conductors sized in accordance with paragraph 4.7.3.1.3. Each connection shall be to the nearest MPG plate or SRS.

4.7.3.1 Multipoint Ground System (MPG)

The protection of electronic equipment against potential differences and static charge buildup shall be provided by interconnecting non-current-carrying metal objects to an MPG that is effectively connected to the EES. The MPG consists of a network of plates and bonding jumpers, racks, frames, cabinets, conduits, wireways, cable trays enclosing electronic conductors, structural steel members, and conductors used for interconnections. The MPG shall provide multiple low-impedance paths to the EES, between various parts of the facility, and between electronic equipment within the facility so that any point of the system has a low-impedance path to the EES. This will minimize the effects of spurious currents present in the ground system due to equipment operation or malfunction, or from lightning discharges. The MPG shall not be used in lieu of the safety ground required by the NEC or as a signal return path.

4.7.3.1.1 Labeling

The MPG shall be clearly labeled to preserve its identity as described in the following paragraphs.

4.7.3.1.1.1 Conductor Identification

MPG conductors shall be labeled in accordance with paragraph 4.7.3.1.6.

4.7.3.1.1.2 Ground Plate Labeling

Ground plates shall be installed in accordance with Table 4.

4.7.3.1.2 MPG - Ground Plates and Buses

Multipoint ground plates shall be located to facilitate the interconnection of equipment cabinets, racks, and cases within a particular area. If more than one ground plate is necessary, they shall be located throughout the facility. Ground buses may be used when distributed grounding is required along a long continuous row of electronic equipment cabinets.

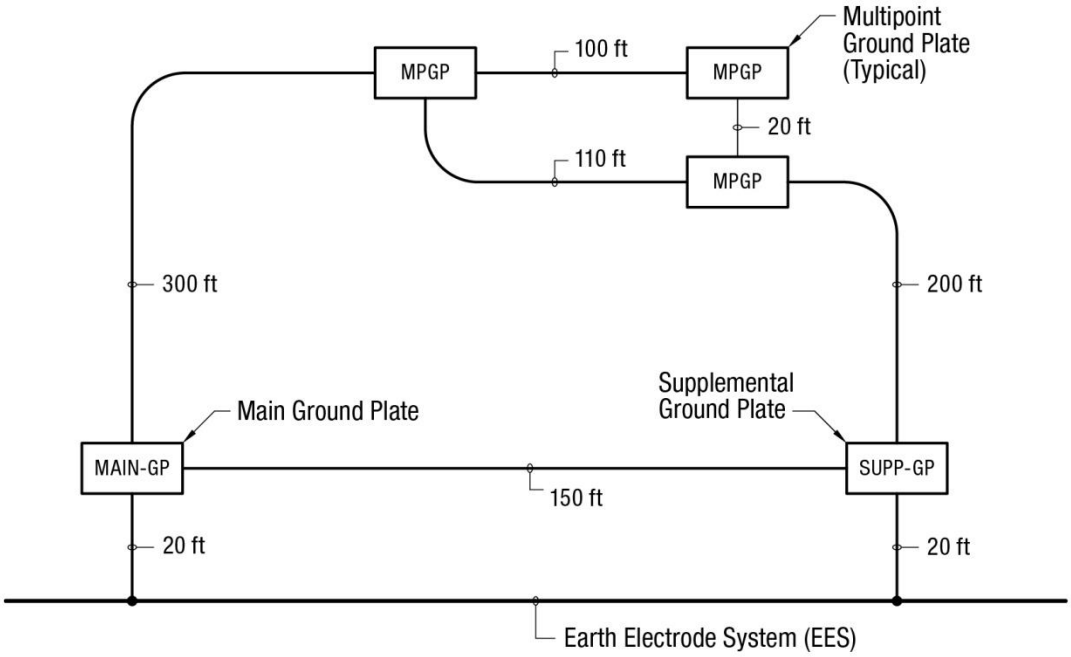
See Table 4 for the multipoint ground plate installation requirements. Ground buses shall be copper material. Ground bus width and thickness shall be selected from Table 3, and shall be as long as required.

Provide a secondary conductor return path for each MPG plate or ground bus. A single-ended, radial connected plate or bus configuration is not permitted. Building structural steel shall not be used as a secondary return path for the MPG.

4.7.3.1.3 MPG Conductors – Plate to Plate and Plate to Bus

Conductors between plates and buses in the multipoint system shall be insulated and sized in accordance with Table 3 based on the maximum path length to the farthest point in the MPG from the EES. To determine the distance to the farthest point in the multipoint system, add the length of conductors in the multipoint system to reach the farthest plate in the system via the longest path as shown in Figure 10. Divide the sum obtained by two to obtain the maximum path length. Use this path length to determine the conductor size from Figure 10, but in no case use a conductor smaller than 4/0 AWG. These conductors shall be insulated, labeled, and color-coded in accordance with paragraph 4.7.3.1.6. In cable trays, ground conductors shall be insulated and separated as far as possible from the other conductors.

Exception. *In plenum spaces, where plenum-rated insulated conductors are not available, bare ground conductors are permitted.*



Notes:

1. Determine the longest cable path between the main and supplemental ground plate connections to the EES by adding the sum of individual cable segments along the pathway.

   Maximum path length = 20+300+100+20+200+20 = 660 ft

2. Divide total obtained in step 1 by two.

   660/2 = 330 ft

3. Determine conductor size from Table 3. Using 330 ft path length, select 750 kcmil size conductor.

Figure 10. Multipoint Ground Conductor Size Determination

Table 3. Size of Electronic Multipoint Ground Interconnecting Conductors

Conductor Size (AWG or kcmil)	Max. Path Length (ft)	Bus Bar Size, See Note 2 (in.)	Max. Path Length (ft)
750, See Note1	375	4 x 1/4	636
600, See Note1	300	4 x 1/8	318
500	250	3 x 1/4	476
350	175	3 x 1/8	238
300	150	2 x 1/4	318
250	125	2 x 1/8	159
4/0	105	2 x 1/16	79
3/0	84	1 x 1/4	159
2/0	66	1 x 1/8	79
1/0	53	1 x 1/16	39
1	41		
2	33		
4	21		
6	14		
8, See Note 3	9		
10, See Note 3	6		
12, See Note 3	4		

Notes:

1. Where these conductors are not available, parallel conductors are permitted, such as three 250 kcmil conductors in place of one 750 kcmil conductor, or two 300 kcmil conductors in place of one 600 kcmil conductor. Conductor sizing is based on providing a cross-sectional area of 2,000 cmil per linear ft. Bus bar sizes are chosen from available cross-sections and shall exceed the cross-sectional requirement of 2,000 cmil per linear ft.
2. Denotes an MPG designed with a continuous bus bar layout in lieu of ground plates and interconnecting conductors.
3. Conductor wire sizes 12 AWG through 8 AWG are permitted only for bond jumper connections between subassemblies and interior cabinet ground plate within the electronic equipment enclosure.

Table 4. Ground Plate Specification Requirements

Plate Type	Acronym	Application Requirements (see article)	Material	Configuration Notes	Identification Notes
Main	Main-GP	4.7.2	Copper	1, 2, 3, 4	5, 6
Supplemental	Supp-GP	4.7.2	Copper	1, 2, 3, 4	5, 6
Multipoint	MPGP	4.7.3.1	Copper	1, 2	5, 6
Single Point	SPGP	5.5.4	Copper	1, 2	5, 6

Notes:	
1.	Plate Dimensions. Ground plate dimensions shall be at least 4 in. wide and 1/4 in. thick. Provide adequate length to accommodate number of bond connections plus at least two spare positions.
2.	Conductor Terminations at Ground Plates. Provide either UL listed hydraulically crimped 2-bolt-hole style terminal lugs or exothermic welds for conductor terminations.
3.	Conductor Terminations at the EES. The connections from ground plates to the EES shall be made with exothermic welds at the EES. The connections shall be as follows: a. Conductor between Main-GP and EES. Provide at least one 500 kcmil conductor. The Main-GP location shall be chosen to minimize conductor length, but shall not be more than 50 ft from the EES. b. Conductor between Supp-GP and EES. Provide at least one 500 kcmil conductor. The Supp-GP location shall be chosen to minimize conductor length, but shall not be more than 50 ft from the EES. The conductor length from Supp-GP to the EES shall be 30 percent longer or shorter than the conductor between the Main-GP and the EES.
4.	Interconnection of Main-GP and Supp-GP. Provide a 4/0 AWG bonding conductor connected between the Main-GP and Supp-GP.
5.	Ground Plate Covers. Provide clear plastic covers with a permanently attached label or metal nameplate. The nameplate text shall be color black with 3/8-in. high letters and Arial font. The cover shall be identified with color-coded overlay markings configured by system type. The nameplate caption and cover identification shall be as follows: a. Main-GP. Provide label caption, "MAIN GROUND PLATE" and cover markings with clear background and green slashed marking tags around the caption. b. Supp-GP. Provide label caption, "SUPPLEMENTAL GROUND PLATE" and cover markings with clear background and green slashed marking tags around the caption. c. MPGP. Provide label caption, "MULTIPOINT GROUND PLATE" and cover markings with green background and bright orange slashed marking tags around the caption. d. SPGP. Provide label caption, "SINGLE POINT GROUND PLATE" and cover markings with green background and bright yellow slashed marking tags around the caption.
6.	Conductor Identification Requirements. See Table 5.

4.7.3.1.4 MPG Conductors - Plate and Bus to Equipment

Conductors from plates and buses in the multipoint system to equipment chassis shall be sized in accordance with Table 3 based on the maximum path length from the plate or bus to the equipment. These conductors shall be insulated, labeled, and color-coded in accordance with paragraph 4.7.3.1.6. In cable trays, ground conductors shall be separated as far as possible from the other conductors. In wireways, ground conductors shall be visible by opening any cover.

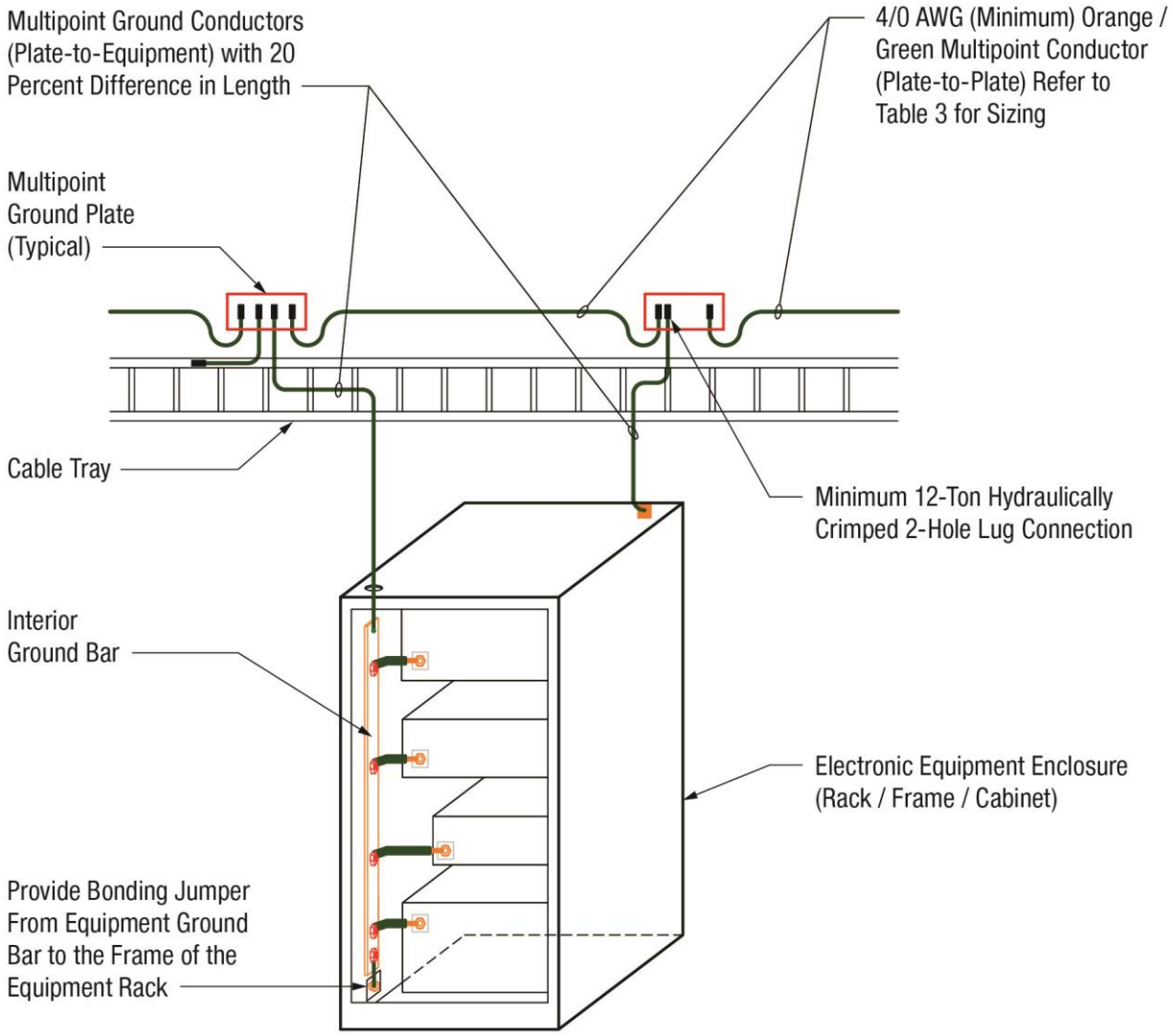
Provide grounding connections between the electronic enclosure and the MPG system in accordance with following:

a. Bonding Connections. Bonding connections shall prevent resonant impedances at equipment operating frequencies. Provide two short low-impedance bonding jumper between the MPG and two corners of the equipment. These bonding jumpers shall be connected as far apart as possible on the equipment (ideally on opposite corners) to reduce mutual inductance, and they shall have few bends or sags. The two bonding connections shall be of unequal length (one of the connections shall be 20 percent longer or shorter than the other) so that if one strap undergoes resonance, by limiting current flow, the other strap will not. Any bend radius in the bonding conductors shall be a minimum of 8 in.

b. Bonding Connectors. Provide bonding conductors size in accordance with Table 3 at MPG system connections.

c. Bonding Connection Length. Bonding connections to the SRS should be as short as possible.

See Figure 11 for typical electronic equipment grounding illustrations.



ILLUSTRATIVE EXAMPLE:

Notes:

1. If MPG conductors are mounted on the side or face of the cable tray, provide cable support at intervals of at least 3 ft. MPG conductor support is not required if the cables are laying on the cable tray system.
2. Paint shall be removed from the bonding surfaces before making grounding connections to the equipment enclosure. The bonding surfaces do not require paint sealing treatment if the connection is made inside an environmentally controlled room.

Figure 11. Electronic Equipment Grounding

4.7.3.1.5 Grounding Conductor Protection

Provide protection for MPG conductors subject to physical damage by use of conduit, floor trenches, routing behind permanent structural members, or other approved means. If grounding conductor is routed through metal conduit, the conduit shall be bonded to the conductor at each end.

4.7.3.1.6 Grounding Conductor Labeling

Provide conductor and pathway identification labeling where cables pass between areas physically separated by walls. Labeling is not required for cables that originate and terminate in the same room, such as a room without wall partitions.

Table 5. Grounding Conductor Insulation Color Codes

Conductor Insulation - Color Identification	Use
Green with red and yellow tracers	Isolated grounds
Green with yellow tracer	Single point ground
Green with orange tracer	Multipoint ground
Green with red tracer	High-Transient ground

Notes:
1. Some commercial off-the-shelf (COTS) equipment uses green with yellow tracer as the color identification for the EGC. These conductors are permitted.
2. Conductor labeling material type and format specification shall be in accordance with FAA-C-1217.

4.7.3.2 Signal Reference Ground Grid (SRGG)

When required, the SRGG shall be provided for raised access floor systems and/or ceiling systems in NAS electronic equipment rooms or areas serving NAS electronic equipment.

The SRGG shall be configured in accordance with the following:

a. Configuration. SRGG shall consist of a grid of 2-in. wide copper strips, 26 gauge or thicker, placed on a 2x2-ft square grid and welded at each grid intersection.

b. Installation Location. SRGG shall be installed below a raised access floor system, below a ceiling or above a suspended ceiling system, or both. The SRGG perimeter shall extend to within 6-in. from the room perimeter or the perimeter of electronic equipment area served.

c. Perimeter Conductor. A minimum 4/0 AWG bare copper conductor loop shall be routed around the SRGG and located within 6 in. from the SRGG perimeter. The SRGG perimeter shall be bonded to the perimeter loop conductor at every grid intersection with a 4 AWG bare copper conductor.

d. Bonding to EES. The perimeter loop conductor shall be bonded to the EES with a minimum of four 4/0 AWG conductors spaced as widely apart as possible.

e. Bonding to Building Steel. Building structural steel located within 6 ft of the SRGG perimeter loop conductor shall be bonded to the loop conductor with minimum 4/0 AWG conductor. Building structural steel located within the perimeter of the SRGG shall be bonded to the SRGG with a minimum 4 AWG conductor.

f. Bonding to Floor and Ceiling Systems. The SRGG shall be bonded to the raised access floor system or the ceiling metalwork at intervals not less than 6 ft using minimum 4 AWG bare copper conductors.

g. Bonding of Multiple SRGGs. Floor and ceiling portions of a SRGG in the served area shall be bonded together with a minimum of four sets of 4/0 AWG conductors spaced as wide apart as possible.

h. Bonding of Raceways and Metal Objects. Conduits, wireways, pipes, cable trays, or other metallic elements that penetrate the SRGG area shall be bonded to the SRGG where they enter the area and every 25 ft for their entire length within the area. Conduits, wireways, pipes, cable trays, and other metallic elements within 6 ft of the grid shall be bonded to the SRGG. These bonds shall be minimum 4 AWG bare copper conductors.

4.7.3.2.1 SRGG to Equipment

Provide bonding straps 1 in. wide and at least 26 gauge solid copper at SRPG or SRGG connections.

4.7.3.3 Signal Reference Ground Plane (SRGP) - Special Conditions

SRGP is a continuous signal reference ground plane constructed of 24 gauge minimum thickness copper sheets. SRGP shall be provided when required by the electronic equipment vendor. SRGP designs shall be approved by the OPR.

4.7.4 Bonding of Electrical Systems in NAS Electronic Equipment Areas

Raceways/conduits, wireways, and electrical distribution equipment shall be bonded to the SRS. Metal framing channel systems used to support conduit/raceway or other equipment are expected to be installed to achieve electrical continuity, and are not required to have additional bonding jumpers between individual assembly components.

4.7.4.1 Conduit Raceways

Every component of metallic conduit runs such as individual sections, couplings, line fittings, pull boxes, junction boxes, and outlet boxes shall be made electrically continuous and bonded, either directly or indirectly, to the SRS or facility steel at intervals not exceeding 25 ft.

If otherwise not indirectly or directly bonded, bond conduits using a minimum 6 AWG bonding conductor. Conduit raceways that are less than 1.5 in. trade size or less than 10 ft in length are exempt from the bonding requirement.

4.7.4.2 Cable Trays and Wireways

If not indirectly or directly bonded, bond individual sections of metallic cable tray and wireway systems together with a minimum 6 AWG insulated copper conductor. Bonds shall be in accordance with section 4.2.

Bonding jumpers between individual sections are not required when all of the following conditions are met:

a. The cable tray or wireway systems are electrically continuous,

b. The systems are UL classified, suitable for use as an EGC,

c. The systems are installed in accordance with manufacturer recommendations.

Where installed in electronic areas, cable trays and wireways shall be bonded to the SRS within 2 ft of each end of the run and at intervals not exceeding 50 ft. The minimum size bonding conductor for connection of a cable tray and wireway to the SRS shall be 2 AWG copper conductor.

4.8 Shielding Requirements

4.8.1 General

The facility design and construction shall include both protective shields to attenuate radiated signals, and separation of equipment and conductors to minimize interference coupling. The equipment design shall incorporate component compartments and overall shields as necessary to meet the electromagnetic susceptibility and emission requirements of MIL-STD-461 as required by NAS-SS-1000 and FAA-G-2100. In addition, the design shall provide personnel safety protection shielding.

4.8.2 Facility Shielding

Shielding of facility buildings, shelters, and equipment spaces shall be provided when other facility or environmental sources of radiation are of sufficient magnitude to degrade the operation and performance of electronic equipment or systems.

4.8.3 Shielding for Conductors and Cabling

Conductor and cable shielding shall comply with the following:

4.8.3.1 Cables and Signal Lines

Cables consisting of multiple twisted pairs shall have individual shields for each twisted pair. The shields shall be isolated from each other. Cables with an overall shield shall have the shield insulated and isolated from individual shields.

Exception. *Structured cabling for computer and telephone networks, such as Ethernet over balanced-line twisted pair with differential signaling design for noise rejection, are permitted to be used without individual shields for each twisted pair.*

4.8.3.2 Cables - Termination of Individual Shields

Shields of pairs of conductors, line shields, and the shield of cables containing unshielded conductors shall be terminated in accordance with the following:

a. Shield Terminations. Shields shall be terminated to ensure correct equipment operation.

b. Shield Termination Lengths. Shield terminations shall consist of minimum length pigtails between the shield and the connection to the bonding halo or ferrule ring and between the halo or ferrule ring and the shield pin on the connector. The unshielded length of a signal line shall not exceed 1 in. with not more than 1/2 in. of exposed length as the desired goal.

c. Shield Isolations. Shields, individually and collectively, shall be isolated from overall shields of cable bundles and from electronic equipment cases, racks, cabinets, junction boxes, conduit, cable trays, and elements of the MPG. Except for one interconnection, individual shields shall be isolated from each other. This isolation shall be maintained in junction boxes, patch panels, and distribution boxes throughout the cable run. When a signal line is interrupted such as in a junction box, the shield shall be carried through. The length of unshielded conductors shall not exceed 1 in. To meet this requirement, the length of shield pigtail longer than 1 in. shall be allowed but shall be the minimum required.

d. Circuits and Chassis. Circuits and chassis shall be designed to minimize the distance from the connector or terminal strip to the point of attachment of the shield grounding conductor to the electronic signal reference. The size of the wire used to extend the shield to the circuit reference shall be as large as possible but not less than 16 AWG or the maximum wire size that will fit the connector pin. A common shield ground wire shall not be used for input and output signals, high and low level signals, signal lines, electronic signal lines, control lines, and power conductors.

e. Extensions. Extension of shields through the connector or past the terminal strip to individual circuits or chassis is permitted if required to minimize unwanted coupling inside the electronic equipment. Where extensions of this type are necessary, overall cable or bundle shields shall be grounded in accordance with paragraph 4.8.3.3.

4.8.3.3 Cables - Termination of Overall Shields

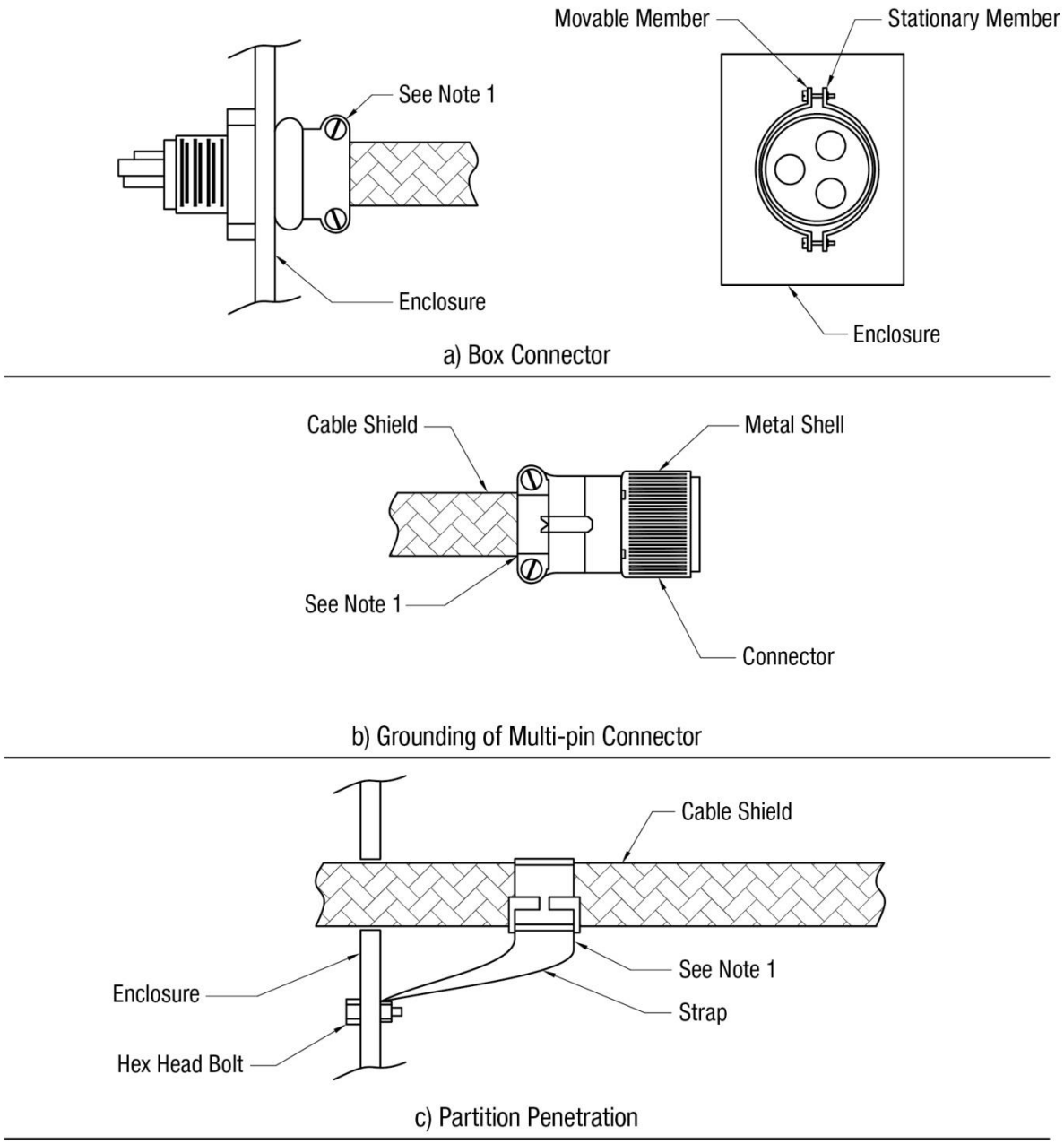
Cables that have an overall shield over individually shielded pairs shall have the overall shield grounded at each end unless otherwise required by the equipment. Grounding through an SPD is permissible if grounding both ends of the conductors degrades system performance. If present, the drain wire shall be grounded in the same manner as the shield.

a. Cable Shields. Cable shields terminated to connectors shall be bonded to the connector shell as shown in Figure 12 (a) or (b). The shield shall be carefully cleaned to remove dirt, moisture, and corrosion products. The connector securing clamp shall be tightened to ensure that a low-resistance bond to the connector shell is achieved along the entire circumference of the cable shield. The bond shall be protected against corrosion in accordance with paragraph 4.2.4.3. The panel-mounted part of the connector shall be bonded to the mounting surface in accordance with paragraph 5.6.6.2.

b. Interruption of Continuity. Where the cable shield continuity is interrupted, such as in a junction box, the shield shall be extended through and grounded at the box. The length of unshielded cable conductors shall not exceed 1 in. Where dictated by constructability constraints, shield pigtails may be longer than 1 in., but shall be as short as possible.

c. Cables Bonded to Penetrated Surfaces. Cables that penetrate walls or panels of cases or enclosures without the use of connectors shall have their shields bonded to the penetrated surface in the manner shown in Figure 12 (c). Overall shields shall be terminated at the outer surface of cases to the maximum extent possible.

d. Overall Shield Grounding. Grounding of overall shields to terminal strips shall be as shown in Figure 13.



Note:

1. Ensure that cable shield is clean and that securing clamp is tightened to provide a suitable ground.

Figure 12. Grounding of Overall Cable Shields to Connectors and Penetrating Walls

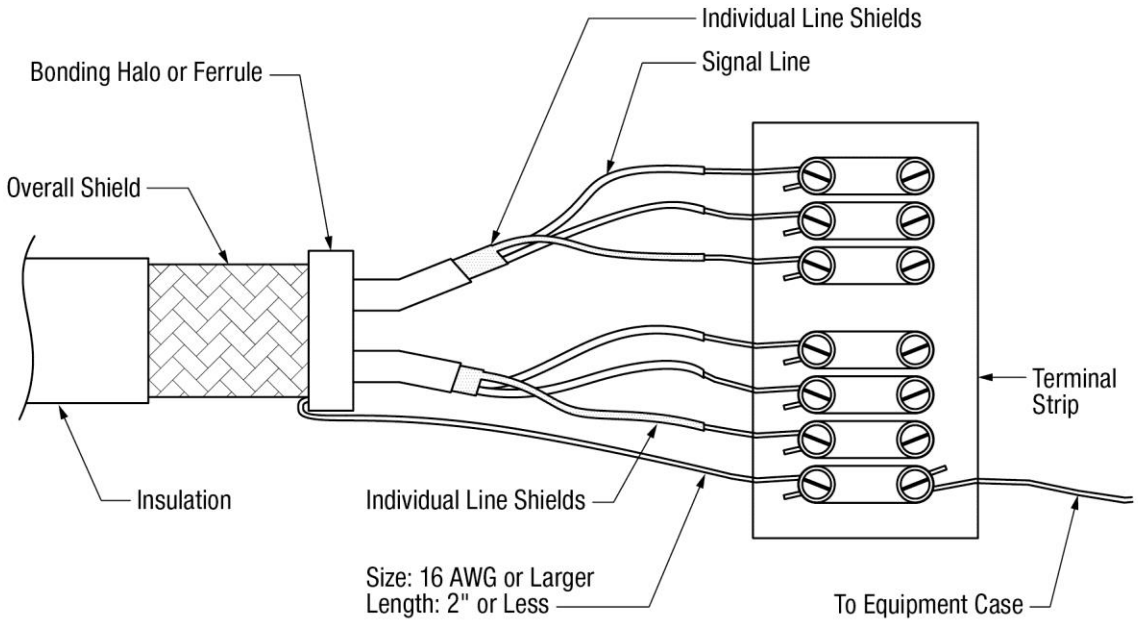


Figure 13. Grounding of Overall Cable Shield to Terminal Strip

4.8.4 Electromagnetic Environment Control

Shielding shall be integrated with other interference control measures such as filtering, wire routing, cable and circuit layout, signal processing, spectrum control, and frequency assignment to achieve the highest operational reliability of the equipment. Implementation procedures necessary to achieve the required filtering and shielding shall be detailed in the control plan described in 5.9.2 to include material requirements, shield configurations, placement and installation limitations, gasket utilization, filter integration, aperture control, bonding and grounding requirements, and wire routing and circuit layout constraints.

4.8.4.1 Space Separation

The design and layout of facilities shall physically separate electronic equipment and conductors that produce interference from other equipment and conductors that are susceptible to interference. The minimum separation distance between power and signal cables shall be in accordance with Table 6.

4.8.4.2 Wire and Cable Routing

The routing and layout of wires, conductors, and cables shall be performed in a manner that does not jeopardize the integrity of the equipment shield. Signals with power level differences of greater than 20 dB shall be routed as far apart as possible. Alternating current power conductors and control lines shall be routed away from sensitive digital or other susceptible circuits. Shielded cables shall be used where required to prevent emissions and/or to provide shielding. Cable shields shall be grounded in accordance with the requirements of paragraphs 4.8.3.2 and 4.8.3.3.

Table 6. Minimum Separation Distance between Signal and Power Conductors

Condition	Circuit Power Level		
	< 2 kVA	2-5 kVA	> 5 kVA
Unshielded power lines or electrical equipment in proximity to signal conductors in open cable tray or nonmetal raceway.	5 in.	12 in.	24 in.
Unshielded power lines or electrical equipment in proximity to signal conductors in a grounded metal raceway.	2.5 in.	6 in.	12 in.
Power lines enclosed in a metal raceway (or equivalent shielding) in proximity to signal conductors in a metal raceway.	-	3 in.	6 in.

4.8.4.3 Bonding and Grounding of Compartment Shields

All shields shall be grounded. Bonding shall be in accordance with section 4.2.

4.9 Electrostatic Discharge (ESD) Requirements

4.9.1 General

Modern electronic and electronically controlled electrical equipment are susceptible to damage from ESD. The requirements of this section are intended to reduce the frequency and minimize the effects of ESD events. Electronic circuitry that contains miniaturized or solid-state components shall be considered ESD susceptible.

4.9.2 Requirements

NAS electrical and electronic equipment, subassemblies, and components subject to damage from exposure to electrostatic fields or ESD shall be protected in accordance with section 5.8. ESD controlled areas shall be provided for operations, storage, repair, and maintenance spaces used for electrical and electronic equipment or subassemblies that are subject to damage from static electricity or ESD.

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5 DETAILED REQUIREMENTS

5.1 Introduction

This chapter describes detailed performance requirements, which are specific to FAA facility applications, organized by facility special conditions and equipment as follows:

a. Airport Traffic Control Tower (ATCT) Facilities

b. Lightning Protection System – Special Conditions

c. Facility Transient Protection – Special Conditions

d. Single Point Ground System (SPG) – Special Conditions

e. NAS Electronic Equipment – Interface and Procurement Requirements

f. Surge Protection Device (SPD) – Procurement Requirements

g. Electrostatic Discharge (ESD) Equipment – Interface and Specification Requirements

h. Electromagnetic Compatibility Requirements

5.2 Airport Traffic Control Tower (ATCT) Facilities

Figure 14 depicts the elemental relationship of areas located at the top of a typical ATCT. Operation of NAS electronic equipment areas located in the cab, junction, and subjunction levels present a unique set of challenges for implementation of lightning and transient protection. NAS electronic equipment areas are spaces where the equipment is physically located or associated passageways that distribute utilities within the tower. Power and telecommunication distribution systems (NAS supporting utilities) either originate from the base of the tower or an attached base building.

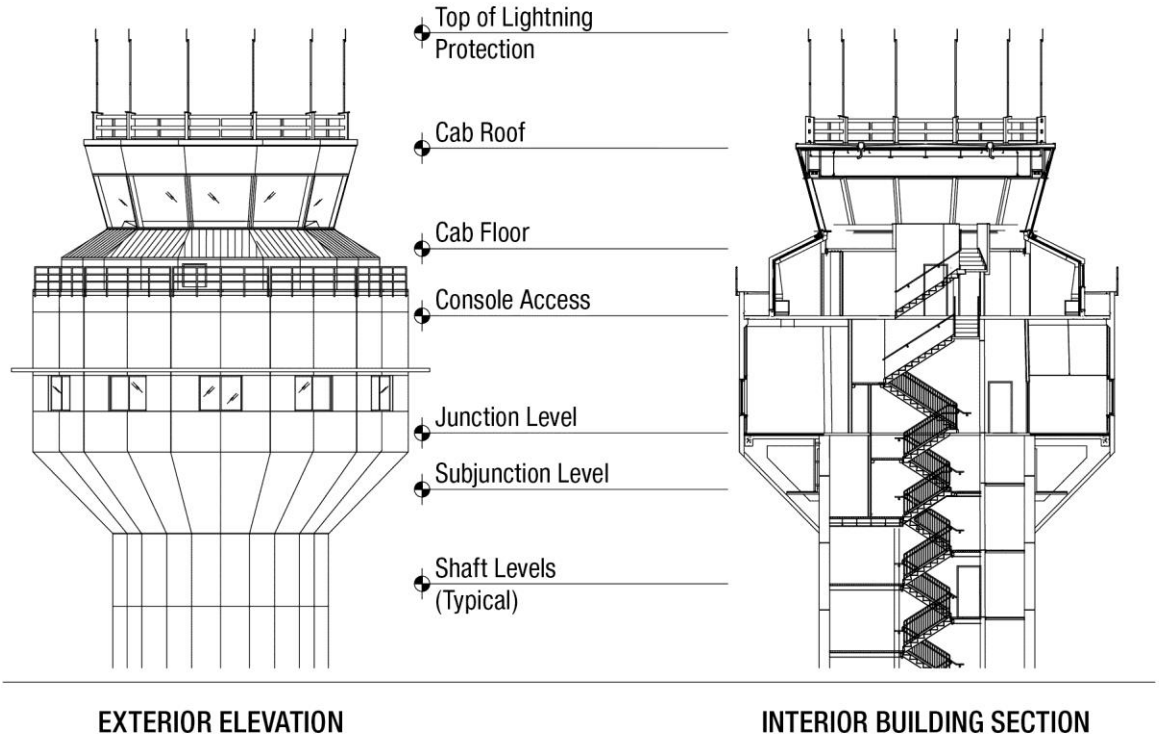


Figure 14. Airport Traffic Control Tower – Typical Floor Levels

5.2.1 General

During lightning strikes, there is a potential difference between the reference voltage at the top of the tower and the base of the tower. It is therefore necessary to reference all systems at the top of the tower to each other and treat this area as a separate facility. The NAS electronic equipment and associated supporting utility distribution system are subject to large electromagnetic fields during a lightning strike. For this reason, special techniques are required to provide an environment that minimizes the damaging effects of lightning. ATCT systems requiring special consideration include:

a. Lightning and Transient Protection

b. Main Ground Connections

c. Power Distribution System

d. NAS Electronic Equipment Areas

5.2.2 Lightning Protection System
Provide lightning protection in accordance with section 4.3, and this section.

5.2.2.1 Common Bonding of Grounded Systems
The lightning protection, electrical, electromechanical, electronic systems, and building structural steel shall be bonded together for safety.

5.2.2.2 Potential Equalization Loop
Provide a continuous potential equalization loop conductor at the following locations:

a. Roof or Roof Parapet. Install a loop conductor within 24 in. of the periphery of the structure. Interconnect air terminals and down conductors to the equalization loop. Any secondary roof area or parts of the structure that extends beyond the upper most roof zone of protection scheme shall be provided with additional air terminals in accordance with NFPA 780.

b. Exterior Platforms, Catwalks, and Personnel Access Areas. Provide a potential equalization loop for platforms that extend beyond the ATCT building perimeter. Interconnect down conductors to the equalization loop.

c. Tower Shaft Intermediate Floor Levels. Install a loop conductor at tower intermediate levels, evenly spaced no more than 60 ft apart, measured from the roof equalization loop. Interconnect down conductors to the equalization loop.

5.2.2.2.1 Horizontal (Side Strike Protection) Air Terminals for Equalization Loop
Provide horizontal air terminals on equalization loops, in addition to the zone of protection scheme, for exterior platforms and catwalks located at the cab, cab roof, or occupied areas along the ATCT shaft. Install the horizontal air terminals positioned at building corners and along the periphery of the loop where required by the lightning protection zone of protection scheme.

Exception. *Horizontal (side strike) air terminals are not required for equalization loops located at intermediate floor levels of the tower shaft within the zone of protection scheme where there are no platforms for personnel access, or electronic or electromechanical equipment.*

5.2.2.2.2 Connection of Down Conductor to Equalization Loop
The connection method between the down and equalization loop conductors shall be in accordance with paragraph 4.3.5.

5.2.2.3 Number of External Down Conductors for ATCT
MIL-HDBK-419A, Volume II, paragraph 1.3.2.2.2(d), provides that “buildings and structures shall add one down conductor for every 60 ft of height or fraction thereof, but horizontal spacing between down conductors need not be less than 50 ft.”

The number of down conductors shall be based on both the ATCT height and its largest horizontal perimeter dimensions. For the purposes of this document, the above referenced 50-ft dimension is the horizontal distance between down conductors along the largest projected

perimeter area. The following guidelines shall be used in determining the number and configuration of external down conductors:

a. External Down Conductors for ATCTs. All ATCTs shall have a minimum of four down conductors. ATCTs greater than or equal to 180 ft above ground level to cab roof shall add one down conductor for every 60 ft of height or fraction thereof above 180 ft. For ATCTs greater than or equal to 180 ft, the number of down conductors may be substituted, but not less than four, by using larger sized individual conductors to achieve equivalent overall conductor cross-sectional area.

   Exception. *Existing ATCTs are exempt from the minimum number of external down conductor requirement, if less than 60 ft above ground level to the cab roof and the horizontal perimeter dimension spacing between down conductors is less than 50 ft. However, when removal of the down conductors is performed as part of a major project, such as when replacing siding of an ATCT, reinstallation shall incorporate the minimum number of down conductors as stated in this paragraph.*

b. Building Structural Steel. Building structural steel is permitted as a substitute for only one down conductor for lightning protection. Concrete encased structural reinforcing bars or precast construction systems are not qualified for use as building structural steel. It is permissible to substitute substantial metal structural elements of buildings for regular lightning conductors where, inherently or by suitable electrical bonding, they are electrically continuous from the air terminal to the earth electrode connection. The structural elements shall have a conducting cross-sectional area, including at the structural connections, at least twice that of the lightning conductor that would otherwise be used. Lightning conductors may be installed on the interior or exterior to the building enclosure. Steel frame buildings enclosed in architectural precast concrete or masonry products shall have external air terminals and roof conductors installed and bonded directly to the structural members to keep the lightning discharge from having to penetrate the masonry shell to reach the frame members. Refer to MIL-HDBK-419A, Volume II, paragraph 1.3.2.2.2(i).

5.2.2.4 Transient Surge Protection

Provide SPDs in accordance with section 4.6 for NAS facility entrance points located at the base building/tower shaft and at the top of the shaft.

5.2.3 Main Ground Connections

A low-impedance connection shall be provided to the EES to ensure good high-frequency grounding during normal operation. Ground connections shall be established in the ATCT as a common point of connection within the facility. Provide ground plates in accordance with paragraph 4.7.2 and as specified herein.

5.2.3.1 ATCT MPG Configuration – Preferred Method

Refer to Figure 15 for MPG configuration topology and connection requirements. A main ground plate shall be established on the lowest level with electrical, electromechanical, or electronic equipment serving the ATCT cab. Grounding systems located at or above this level of the ATCT shall be connected to this main ground plate. Provide a combination of conductors, in accordance

with Table 7, and two parallel paths as indicated in Figure 15. Install each conductor path within separate chases located in the tower shaft. Conductors shall be routed continuously between ground plates without sharp bends, loops, or kinks.

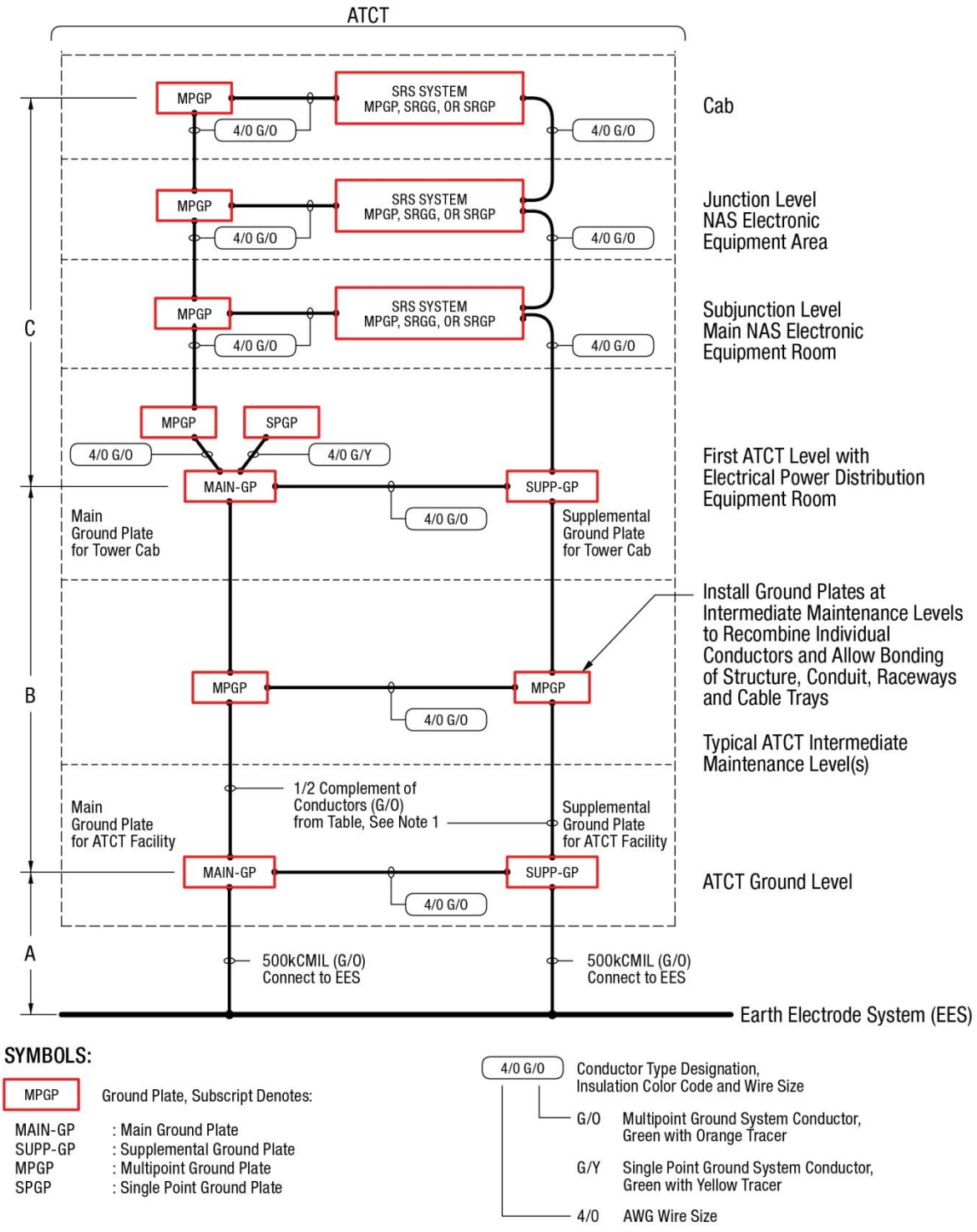
Recombine risers to an MPG plate at each maintenance level of the ATCT shaft. These conductors shall be mechanically bonded to the main ground plate and the base plate. Connect base plate(s) exothermically to the EES with the same number and size of conductors used for the riser conductors in accordance with Table 7.

5.2.3.2 ATCT MPG Configuration - Alternative Method

Refer to Figure 16 for MPG configuration topology and connection requirements. A main ground plate shall be established on the lowest level with electrical, electromechanical, or electronic equipment serving the ATCT cab. Grounding systems located at or above this level of the ATCT shall be connected to this main ground plate. Provide a combination of conductors, in accordance with Table 7, and connect this main ground plate to a plate at the base of the ATCT. These conductors shall be routed continuously from the main ground plate to the base plate without sharp bends, loops, or kinks.

Table 7. ATCT MPG Configuration – Parallel Conductor Complements

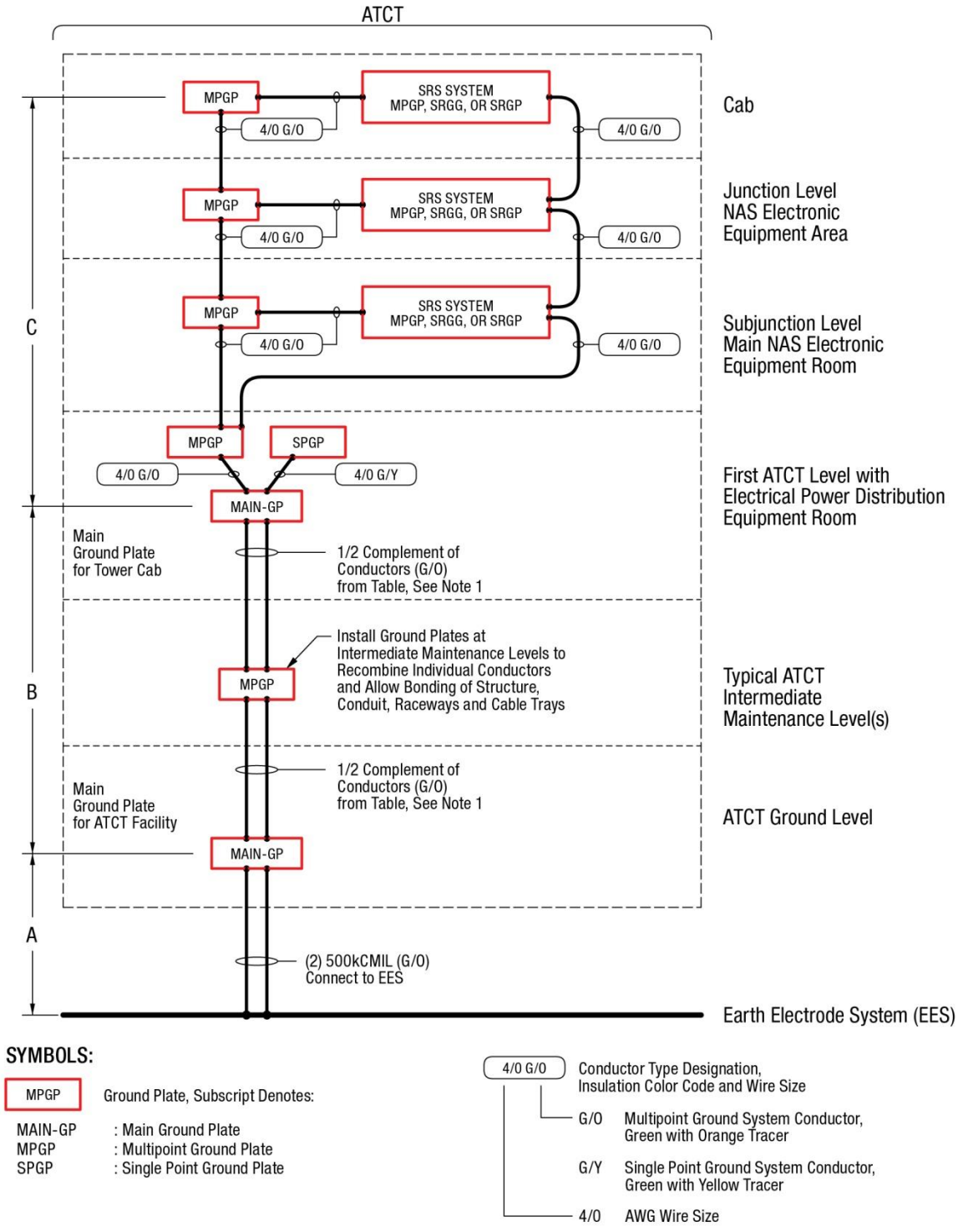
Electrical Distance from EES to Farthest MPG Plate Measured in Feet, See Note 1	Two (2) Conductor (kcmil)	Three (3) Conductor (kcmil)	Four (4) Conductor (kcmil)	Five (5) Conductor (kcmil)	Six (6) Conductor (kcmil)	Number of 4/0 (AWG)
Up to 250	500	350	250	4/0	-	5
251 to 300	600	400	300	250	4/0	6
301 to 350	700	500	350	300	250	7
351 to 400	800	600	400	350	300	8
401 to 450	900	600	500	400	300	9
Note: 1. Refer to Figure 15 and Figure 16 for conceptual MPG configurations.						



Note:

1. Total height calculation (A+B+C) shall be used to determine cable size parameter indicated in Table 7.

Figure 15. Typical Electronic Equipment Grounding Riser Diagram for ATCT (Preferred Method)



Note:

1. Total height calculation (A+B+C) shall be used to determine cable size parameter indicated in Table 7.

Figure 16. Typical Electronic Equipment Grounding Riser Diagram for ATCT (Alternative Method)

5.2.4 Power Distribution System

Provide power distribution for ATCT in accordance with section 4.5 and as specified herein.

a. NAS Electronic Equipment Power Loads. Provide separately derived power sources for NAS electronic equipment loads when the ATCT height is greater than 100 ft measured to the cab floor level.

b. Separately Derived Power Systems. The separately derived systems shall be grounded in accordance with the requirements of NEC article 250 at the first downstream disconnecting means or overcurrent device. The GEC shall be connected directly to the tower cab main ground plate in accordance with paragraph 5.2.3, where possible, or terminated to the nearest effectively grounded structural steel member. This point of connection is mandated to facilitate the effective installation of an SPD.

c. Surge Protection. Provide SPDs in accordance with paragraph 4.6.2. Each SPD shall be installed on the load side of the first downstream disconnecting means or overcurrent device of each separately derived system.

d. Bonding of Metallic Piping Systems. The interior metallic piping supply systems located at the top and bottom of the ATCT mechanical piping chase, such as water, plumbing, and mechanical piping systems, shall be bonded to the main ground plates established in accordance with the requirements paragraph 5.2.3. If interior metallic piping systems are not located near the main ground plate, bond interior piping to the nearest MPGP. This connection is in addition to the bonding requirements of NEC article 250.

5.2.5 NAS Electronic Equipment Areas

Provide grounding and bonding for NAS electronic equipment in accordance with section 4.7 and paragraph 5.2.3 and as specified herein.

5.2.5.1 ATCT Building Structural Steel Bonding Requirements

Structural steel columns and beams of the ATCT shall be bonded together and to the EES in accordance with paragraph 4.5.6 and as specified herein.

The design of the ATCT shaft shall make provisions to ensure that all concrete reinforcing steel used throughout the shaft is electrically bonded together, continuously, horizontally and vertically, and to the EES.

Horizontal metal transitions, such as floors, stairs, and walkways shall be bonded to the ATCT structural steel members or concrete reinforcing steel bars at every level. Elevator support structures shall be bonded to horizontal metal transitions and to the EES. All bonding jumpers shall be a minimum 2 AWG copper conductor.

5.2.5.2 Signal, Communications, Axial Cables, and Control Line Protection

Transient protection shall be applied at each end of vertical cables routed between the equipment room located near the top of the ATCT and the associated base building. Cables between the tower cab and equipment room areas shall be protected in accordance with paragraph 4.6.3. Both

facility and equipment levels of protection shall be provided for these lines. Enclosing metallic cabling in ferrous conduit or the use of all dielectric fiber optic cable can significantly reduce the threat of lightning related damage to ATCT and base building circuits.

5.2.5.3 Signal Reference Structure

An SRS shall be constructed in accordance with applicable requirements of paragraph 4.7.3, including the cab and other areas at the top of the ATCT that contain electrical, electromechanical, or electronic equipment serving the cab.

a. SRGG Installation. The main and supplemental ground plates and building steel may be used to establish equipotential bonding for the SRGG perimeter loop conductor in lieu of the EES for facilities located at the top of the ATCT. Provide one connection between the perimeter loop conductor to the main and supplement ground plates. Provide at least two additional connections between the perimeter loop conductor and building steel.

5.2.5.4 Floor Coverings for Electronic Equipment and Operational Areas

Floor coverings for cab and areas serving the cab shall either be tile or carpeting and shall be composed of static dissipative material. The floor coverings and installation shall be per the manufacturers' specifications and paragraph 5.8.9 and shall be connected to a component of the SRS, but not to the SPG system.

5.2.5.5 Single Point Grounding

SPGs, if required, shall be constructed in accordance with section 5.5. SPGs and independent ground systems required by equipment manufacturers shall be bonded to the ATCT main ground plate, located at the top of the tower, in accordance with the requirements of paragraph 5.2.3. The SPG shall be constructed in a radial configuration and not form a loop.

5.3 Lightning Protection System – Special Conditions

5.3.1 General

This section describes facilities or systems that require additional design considerations for installation of lightning protection systems. The following applications are addressed:

a. Antenna Towers

b. Antenna Protection

c. Tower Guying

d. Waveguide, Axial Cable, and Conduit Grounding

e. Staircase/Ladder Protection

f. Facilities without Buildings or Antennas

g. Lightning Protection for Fences and Gates

h. Lightning Protection for Photovoltaic Solar Arrays

5.3.2 Antenna Towers

5.3.2.1 Number of Down Conductors for Towers

Towers consisting of multiple, parallel segments or legs that are erected on a single pad or footing not over 9 ft^2 in area are considered pole type towers. Other towers shall have at least two down conductors. Large towers, such as radar towers, shall have one down conductor per leg. Down conductors on towers shall be bonded to each tower section. Down conductors shall be routed down the outside of the legs wherever possible and secured at intervals not exceeding 3 ft.

5.3.2.2 Pole Type Towers

Pole type towers shall be protected by at least one air terminal and have at least one down conductor. This is to provide a zone of protection for antennas located on the tower.

5.3.2.3 Towers without Radomes

Protection shall be provided for large radar antennas by extending structural members above the antenna and mounting the air terminal on top as shown in Figure 17 unless directed otherwise by the radar system OPR. Structural members shall be braced as necessary and shall not be used as part of the air terminal or down conductor. The air terminal shall be supported from structural framing and shall have a UL listed fitting on its base. The down conductor from the air terminal shall be connected to a perimeter conductor that forms a loop around the perimeter of the tower platform. Down conductors shall extend from the perimeter conductor to the EES. Each air terminal shall be provided with at least two paths to the ground. Conductors shall be in accordance with NFPA 780. Tower legs shall be bonded to the EES with a 4/0 AWG copper conductor exothermically welded at each end. This bonding conductor shall be either a separate conductor, or permitted to be a part of the down conductor, as described in paragraph 4.3.5.1.

5.3.2.4 Radomes

Radomes shall be located within a zone of protection established according to the 100-ft radius "rolling sphere model" described in NFPA 780. This protection is provided by air terminals mounted on the radome, or by air terminals or catenary wires mounted independently of the radome. Air terminals mounted on the radome must have two paths to the EES. A perimeter conductor shall be provided at the radar antenna deck level.

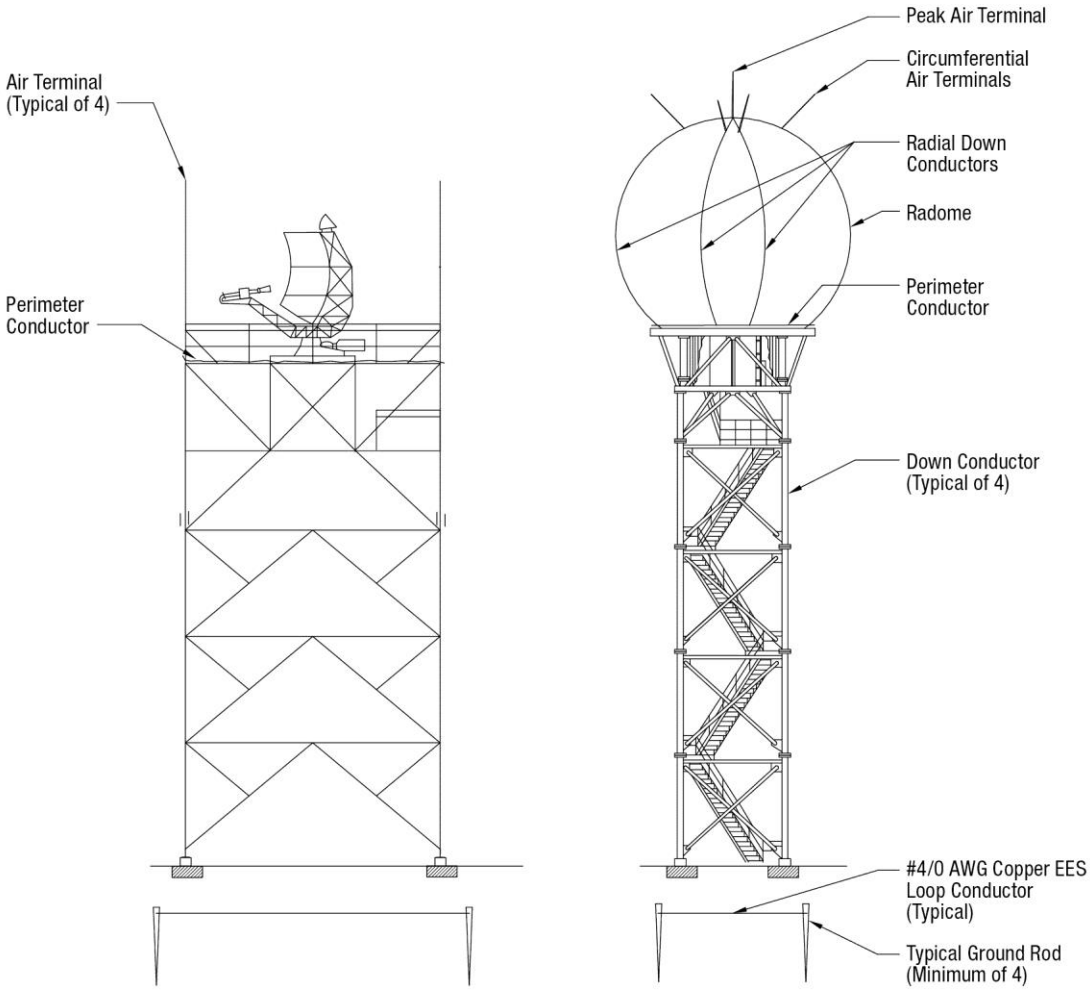
Lightning protection systems for standalone radomes shall be designed and installed in consultation with the OPR of the radar system and the OPR of this document. Paragraph 5.3.2.5 shall be used as guidance in developing lightning protection systems for these radomes.

5.3.2.5 Towers with Radomes

Lightning protection systems for towers with radomes shall be designed and installed in consultation with the OPR of the radar system and the OPR of this document.

Towers with radomes shall be protected with a minimum of one 2-ft-long air terminal at the peak and four or more air terminals equally spaced along the circumference of the radome and oriented perpendicular to the radome. The spacing and quantity of circumferential air terminals shall be adjusted if the antenna pattern is affected, but their sizing, position, and height shall establish a protection zone as specified in paragraph 5.3.2.4. Circumferential air terminals shall be interconnected with main-sized conductors.

Radial down conductors, as indicated in Figure 17, shall be connected to the air terminal on the peak. The radial down conductors shall also be connected to the perimeter conductor that forms a loop around the base of the radome. Radial down conductors on the radome shall be routed from the air terminal at the peak of the radome, in a path following the contour of the radome, to a connection with the circumferential air terminals and then to a connection with the perimeter conductor as shown in Figure 17. Deviations from the shortest possible path are permitted where nearfield radar analyses determine that interference from the conductors will degrade the performance of the radar. Bends in the radial down conductors on the radome shall maintain the largest possible radii and in no case shall be less than 12 in. One down conductor per leg shall connect the perimeter conductor at the base of the radome to the EES. Down conductors shall be bonded to each leg section. Tower legs shall be bonded to the EES with a 4/0 AWG copper conductor exothermically welded at each end. This bonding conductor can be the same conductor required in paragraph 4.3.5.1.



Notes:

1. Bond down conductors to each tower leg section. Exothermically weld down conductor to a 4/0 AWG copper conductor above grade. Route 4/0 AWG conductor though a 1-in. PVC conduit around the foundation concrete pier to 12 in. below grade and connect the conductor to the EES.
2. Where a radome has an electrically continuous frame, the framing may be used in lieu of the lower air terminals.
3. All lightning protection connections shall be free of paint and galvanizing. Scrape all steel free of surface contaminants prior to making exothermic welds or mechanical connections.

Figure 17. Lightning Protection for Radomes and Radar Antenna Platforms

5.3.3 Antenna Protection

Air terminals shall be located to protect structural towers and buildings, and antennas mounted to towers and on buildings.

Most antennas throughout the FAA can be installed or engineered to be installed within the lightning zone of protection. However, there are select times where engineered solutions cannot be easily installed. Antennas may be deemed sacrificial if either of the following conditions exist:

a. A 20 foot air terminal (or air terminal installed on a support with the combined height of 20 feet) does not provide proper zone of protection; or

b. Lightning protection for an antenna will cause radiation pattern distortion.

Sacrificial antennas shall comply with the following:

a. Bonding and surge protection in accordance with 4.6.3, 5.3.5, and 5.4.3.2; and

b. The antenna or base is bonded to the lightning protection system.

All sacrificial antennas must be identified by the designer/program office to the SSC (e.g. ASSC). An SRM is one established method that is permitted to meet this requirement.

5.3.4 Tower Guying

Provide grounding and bonding for tower guying in accordance with TIA-222.

5.3.5 Waveguide, Axial Cable, and Conduit Grounding

Waveguide, axial cable, and conduit located on the tower and feeding into the facility shall be bonded to a bulkhead ground plate mounted on the tower and configured in accordance with 5.4.3.2.

a. Overhead Cable Runs. Bulkhead plate bonding connections shall be located above the cable path at transition/turning point (90 degree bend point) near the tower's base where the cable transitions horizontally from the tower and enters the facility. Above-ground ferrous conduit located at the facility entrance shall be bonded in accordance with 5.4.3.1.1.

b. Underground Cable Runs. Bulkhead plate bonding connections shall be located above the cable transition point where the cables enter the facility conduit riser. If cables enter ferrous conduit, the conduit shall be bonded to the EES in accordance with 5.4.3.1.

5.3.6 Staircase and Ladder Protection

The metallic staircase or ladder access to the tower shall be exothermically bonded near its base to the EES with a 4/0 AWG copper conductor installed in a location that avoids accidental tripping or striking hazards that could result in personnel injury. Where the staircase or ladder material is not thick enough for an exothermic weld, provide a two-hole hydraulically crimped connection. To ensure electrical continuity, sections of stairs or platforms that are not welded together shall be connected by bonding jumpers.

5.3.7 Lightning Protection for Facilities without Buildings or Antennas

Small facilities such as Runway Visual Ranges (RVR) commonly are built without buildings or antennas. Since loss of these facilities can have a significant impact on NAS operations, these facilities shall be included within a zone of protection with either air terminals or overhead catenary wires.

5.3.8 Lightning Protection for Fences and Gates

General airport fencing is not subject to the requirements of this standard. Non-FAA owned fencing that is adjacent to FAA facilities shall be protected as mandated by agreement with the owner of the fencing.

Fences shall be constructed using electrically conducting materials (for example, chain link fabric, metal crossbar, stranded wire, etc) using metal posts that extend a minimum of 2 ft below grade into a concrete base. Metallic fence fabric with nonconductive coatings is not permitted, except where corrosive climatic conditions require corrosion protection.

5.3.8.1 Fence Grounding

Provide fence grounding in accordance with the following:

a. Fence Post Grounding. Provide a ground rod adjacent to the fence post. Locate ground rods at horizontal linear spacing intervals not greater than 100 ft along the perimeter fence line. Provide a 4/0 AWG bare stranded copper conductor, exothermically welded to each ground rod and fence post.

b. Ground Rod Installation. Ground rod material and installation parameters shall be in accordance with paragraph 4.4.4.1. If soil conditions will not permit installation of ground rods, provide ground dissipation plate(s) in accordance with paragraph 4.4.4.3.

c. Fence Gate. Provide a 1-in. by 1/8-in. flexible tinned copper bond strap or an insulated 4/0 AWG flexible welding type copper conductor connected between the gate and adjacent fence post. Exothermic welding is recommended for these connections. Install the bonding strap between the gate and post so it will not limit full motion of a swing or slide gate.

d. Fence Gate Post. Provide a ground rod adjacent to each gate post. Install a 4/0 AWG bare stranded copper conductor, exothermically welded to the ground rod and gate post. Locate the post connection at not greater than 1-ft above grade. Interconnect ground rods located between the gate opening with an exothermically welded 4/0 AWG bare copper conductor buried below frost depth, but not less than 18-in. below ground.

e. Fence Gate Fabric. Provide a horizontal 6 AWG bare stranded tinned copper conductor threaded continuously through the gate fabric and mechanically bonded to the gate vertical support rails.

f. Fence Security - Barbed Razor Wire. Bond security wires to the fence post using 6 AWG bare stranded tinned copper conductor and UL listed bonding connectors. Bond across terminations in the security wire using a short piece of the security wire material and UL listed bonding connectors at the same locations in 5.3.8.1 (a), (c), and (d).

g. Fence Wire Fabric - Chain Link. Attach metallic fence fabric to fence posts with wire ties of the same material.

h. Proximity to a Facility EES. Portions of a fence that are located within 22 ft of a facility EES shall be bonded to that EES with a 4/0 AWG bare copper conductor exothermically welded to a fence post ground rod. Connections shall be made at a maximum spacing of 100 ft, with a minimum of two connections.

See Figure 18 for illustration of fence grounding installation methods.

5.3.8.1.1 Architectural Style Fences

Where architectural fences are installed, bond the nearest post with a two-hole hydraulically crimped lug to the ground rod. The security barbed razor wire bonding requirement does not apply to architectural fences.

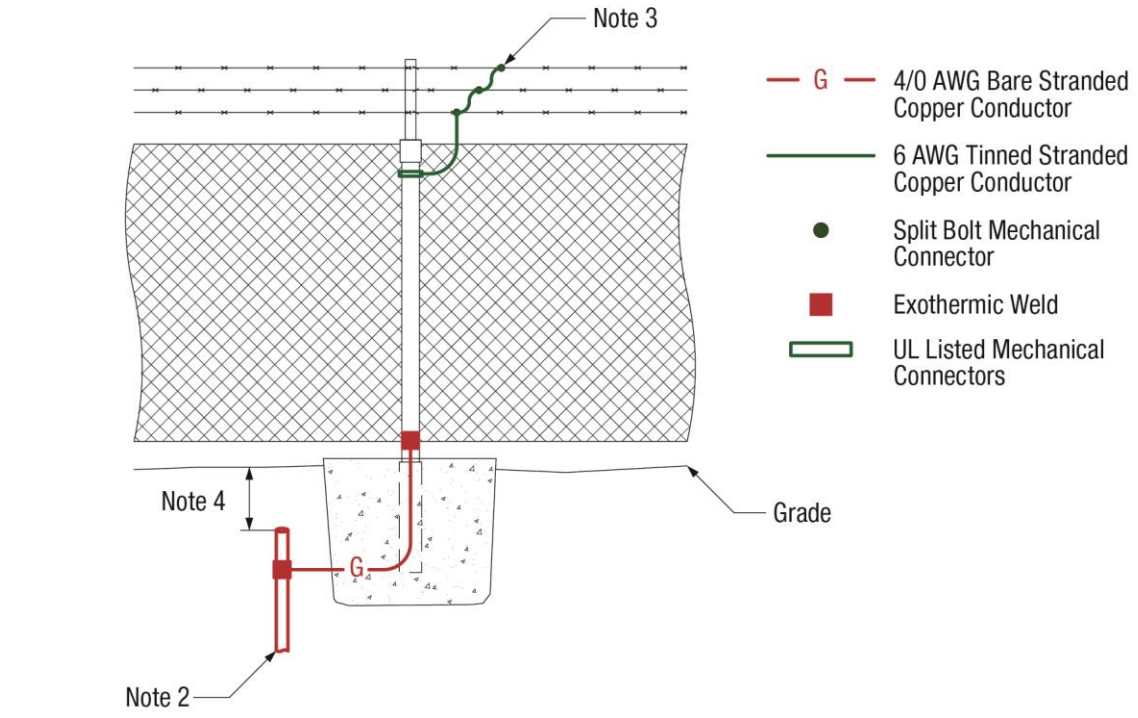
5.3.8.2 Fences Crossed by Overhead Power Lines

At locations where overhead power lines cross a fence, bond a fence post no more than 20 ft on each side of the crossing to a ground rod with a bare 4/0 AWG copper conductor. Bond the fence fabric at the top, middle, and bottom of the fence, and bond each strand of security wire placed above the fencing fabric to the grounded post with a bare 6 AWG tinned copper conductor. Where cross-bars or stranded wire is used to support the fence posts, bond the cross-bars or wire supports to the posts.

These connections shall be located 20 ft on side of the overhead power line crossing.

5.3.9 Lightning Protection for Photovoltaic Solar Arrays

Lightning protection for photovoltaic solar arrays shall be provided in accordance with NFPA-780.



Illustrative Example: Chain Link Fence

Notes:

1. Diagram depicts elemental parts of a typical fencing grounding and bonding installation. Other architectural style fence configurations are possible.
2. Install 10 ft long by 3/4 in. diameter copper clad ground rods at all corners, gate posts, and at intervals not to exceed 100 feet. Exothermically weld each ground rod to the post.
3. Mechnically bond each strand of security wire to the fence post at all corners, gate posts, and at intervals not to exceed 100 feet.
4. 12 in. minimum below grade, but not less than frost depth.

Figure 18. Fence Grounding

5.4 Facility Transient Protection – Special Conditions

5.4.1 General

This section describes additional design considerations for facility transient protection against induced currents from nearby, direct, or indirect lightning strikes. All metallic conduits, conductors, and cables in NAS operational facilities can be subject to currents induced by nearby lightning strikes. These induced effects can adversely affect the operation of sensitive electronic equipment.

5.4.2 Existing Metallic Conduit, Conductors, and Cables

Unless not approved by the facility manager, all unused conduits, conductors, and cables shall be removed.

For any remaining unused items, the voltage differential between ends shall be minimized by the following bonding methods:

a. Unused Metallic Conduits. Metallic conduits shall be bonded to adjacent grounded metalwork at both ends. If not directly bonded, the connection shall use a minimum 6 AWG jumper not longer than 18 in.

b. Unused Conductors and Cables. These conductors and cables shall be bonded to adjacent grounded metalwork at both ends. Multiple unused conductors shall be grouped together and bonded to the adjacent metalwork, directly or with a bonding jumper.

   ***Exception**. Bonding is not required for unused conductors of a structured cable system and vertical risers installed for spare purposes for the following conditions:*

   1. *Vertical cable risers are located no more than 50 ft from grounded metalwork.*
   2. *Cable circuit length totals are not more than 300 ft and do not pass between facilities.*
   3. *Cable circulating currents are present; installation of a SPD at one end of the cable may be used for this condition.*

c. Cables With Shields. Unused shielded cables shall be bonded to adjacent grounded metalwork at both ends.

5.4.3 Electromagnetic Shielding for Lines, Conductors, and Cables

5.4.3.1 Facility Entrance Conduit

Direct routed conductors and cables, both buried or above ground, shall enter the facility through a minimum of 10-ft ferrous RGS conduit at the exterior face of the building. For above-ground conditions, provide a minimum 10-ft ferrous RGS conduit on the exterior face of the facility at the entrance point. Entrance conduits shall be bonded to the EES with a bare copper stranded conductor, 2 AWG minimum. This entrance conduit, if buried, shall extend a minimum of 5 ft beyond the EES. Entrance conduits can be bonded below or above grade.

Exception. *Power feeders maintained by and installed to the requirements of the electric utility provider are exempt from the facility entrance RGS requirement.*

5.4.3.1.1 Above-Ground Conduit Entrance to Facility

At the conduit entrance point, a bonding connection shall be made either to the EES or to a bulkhead connector plate that is bonded to the EES in accordance with paragraph 5.4.3.2. If neither of these bonds is feasible, the bond shall be made to the main or supplemental multipoint ground plate. Provide a minimum 2 AWG stranded copper conductor using exothermic welds or UL-listed pressure connectors for this connection.

5.4.3.1.2 Conduit Joints and Fittings

Conduit joints and fittings shall be electrically continuous with bonding resistance of 5 mΩ or less between joined parts. Conduit enclosing signal, control, status, power, or other conductors to electronic equipment shall be terminated using conductive fittings to their respective junction boxes, equipment cabinets, enclosures, or other grounded metal structures.

5.4.3.2 Metal Bulkhead Connector Plates

A metal bulkhead connector plate shall be provided where overhead axial-type cables and waveguides enter the facility. The bulkhead connector plate shall be mounted on the outside surface of the facility or inside the facility within 2 ft of an exterior wall.

a. Bulkhead Plate Dimensions. Ground plates shall be 1/4-in. thick copper or aluminum, and shall have the required number and type of feed-through connectors for axial cable terminations. Plates shall have adequate surface area for bonding all components, such as waveguides, cable shields, and conduits, plus at least two spare positions.

b. Bulkhead Plate Connections. Provide either hydraulically crimped two-bolt-hole style terminal lugs or exothermic welds for conductor connections to the ground plate. Bonding jumpers shall be as short as possible.

c. Cable Shields. Cable shields shall be bonded and grounded, except where the shield must be isolated for proper equipment operation. If external and internal cables are of different sizes, the changeover in cable size is permitted by feed-through connectors at the plate.

Bulkhead plates shall be bonded to the EES with a minimum 4/0 AWG copper cable, color-coded green with a red tracer. When the bulkhead connector plate is located within 6 ft of the building steel, the bulkhead plate shall be connected to the building steel with a 4/0 AWG insulated copper conductor, color-coded green with a red tracer. The building structural steel shall be bonded to the EES using exothermic welds.

Axial type cables, waveguides, and conduits that are not directly bonded to the EES shall be bonded to bulkhead plates with a minimum 6 AWG bonding jumper. The waveguide bonding cable can be connected to the bulkhead waveguide flange with a ring terminal specifically sized for the application. Conduits shall be bonded with a UL-listed U-bolt bonding connector. Axial cable shields shall be bonded with bonding kits sized for the specific cable type. Where SPDs are installed for axial cables, they shall be installed on the antenna or surge side of the metal

bulkhead plate. The SPD ground bus bar shall not be connected to the lightning protection system.

Where a bulkhead plate is installed on top of an ATCT, then the ground conductor can be bonded to building steel as opposed to the EES. Reinforcing bars shall not be used in lieu of building steel.

Where a bulkhead plate is installed on top of a building or base building and the path is longer than a tenth of the difference between building steel and the EES (i.e. building steel is 5 feet away and the EES is more than 50 feet away), then the ground conductor can be bonded to building steel. Reinforcing bars shall not be used in lieu of building steel.

5.4.3.3 Facility External - Buried Power Cables and Conductors

Buried external power cables and conductors shall have magnetic shielding to prevent damage from coupling of transient currents due to lightning or other electrical sources. This shielding shall be provided by a ferrous metal sheath, ferrous armor, or ferrous RGS conduit.

Cables are permitted to be installed in metallic or nonmetallic conduit where permitted by the NEC. When a conduit is not used for installation of buried cables, the cables shall be identified for direct earth burial (DEB).

Ferrous shielding is recommended for portions of buried power cables and conductors located beyond 300 ft cable length from the facility entrance point. Facility entrance surge protection shall be in accordance with paragraph 4.6.2.1.

5.4.3.3.1 Armored DEB Cables

Steel armor is the preferred assembly for Armored DEB cables. DEB cable armor shall be bonded to the EES with a 2 AWG conductor prior to entry into a facility or where transitioning to conduit.

DEB cable armor shall also be bonded to the main or supplemental ground plate. If bonding to the main or supplemental multipoint ground plates is not feasible, the armor shall be bonded to the electrical ground bus located at the SDM.

If armor is continued to the electronic equipment, bond the cable armor to the equipment MPG plate.

When the electronic equipment is required to be isolated, bond the cable armor to the equipment SPG plate in accordance with section 5.5.

For initial cable installations, bond resistance shall be less than 5mΩ between joined parts. Complete cable replacement is not required if only a short length of the installation does not meet this requirement.

5.4.3.3.2 Guard Wires

A 1/0 AWG bare copper stranded guard wire shall be provided for buried cables and conductors not routed in ferrous conduit, except as noted below.

Exception. *Guard wires are not required for penetration under runways, taxiways, or topographical features or for 15 kV concentric neutral power cables constructed in accordance with FAA-C-1391d, paragraphs 5.5.7 and 5.5.8. This exception does not apply to concrete-encased PVC duct bank with communication, data, or control cables or to spare ducts that do not contain a corrugated innerduct reserved exclusively for fiber optic cables.*

The guard wire shall be configured as follows:

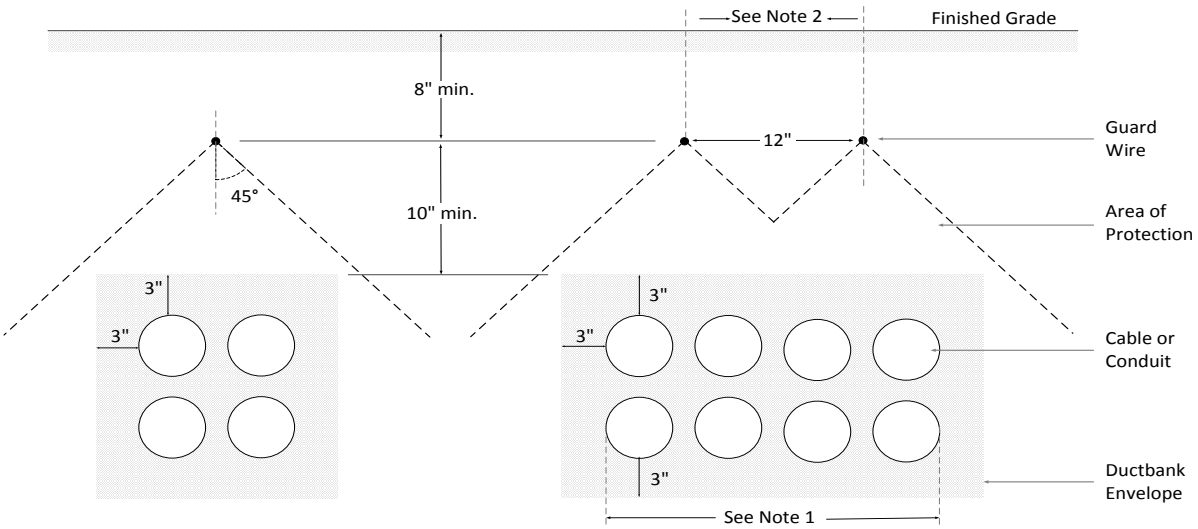
a. Location. The guard wire should be located at least 8 in. below the finished grade, at minimum height of 10 in. above the cable or cable ductbank, and shall run parallel to the cable or cable ductbank path that is being protected.

b. Number of Wires. Provide one guard wire when the width of the cable ductbank is less than 3-ft wide. Provide additional parallel guard wire runs for cables or cable ductbanks wider than 3 ft, in accordance with the Area of Protection criteria. The guard wires should be spaced approximately 12-in. apart to provide an area of protection for the cable ductbank.

c. Area of Protection. This is the protected area encompassed within a 45 degree zone on either side of the guard wire as illustrated in Figure 19.

d. Bonding to EES. Guard wires shall be bonded to the EES at each end, and to ground rods located at approximately 90-ft intervals along the guard wire path using exothermic welds. The spacing between ground rods must vary by 10 to 20 percent to prevent resonance. Install the ground rods approximately 6 ft on either side of the ductbank trench.

e. Airfield Runway Lighting. Where the cable or cable ductbank runs parallel to the edge of a runway, the ground rods shall be located at least 10 ft clear of the navigation lights in the direction of open available space away from the runway or lighting pathways.



Notes:

1. Provide additional parallel guard wire runs for cables or cable ductbanks wider than 3 ft.
2. The spacing intervals between the center lines of the guard wires should not exceed twice the height distance between the guard wire and ductbank.

Figure 19. Buried Guard Wire Detail for Underground Cables or Cable Ductbanks

5.4.3.3.3 Buried Landlines

The preferred type of buried landline that represents best engineering practice is fiber optic type. Fiber optic cable does not require electromagnetic shielding and is exempt from these requirements.

Metallic buried landlines that carry NAS critical, essential, or mission support services to a facility shall have a ferrous shield or be enclosed in ferrous RGS conduit. Ferrous shielding is recommended for portions of these buried landlines located beyond 300-ft cable length from the facility entrance. Facility entrance surge protection shall be provided for these landlines in accordance with paragraph 4.6.3.

5.4.4 Balanced Pair Cables

When possible, shielded circuits should be provided for signal and control circuits routed external to electronic equipment. Balanced pair cables shall be two-conductor circuits.

5.4.5 Fiber Optic Cable

When possible, fiber optic cables should be used in lieu of metallic cables. Fiber optic cables are inherently not susceptible to electromagnetic interference (EMI) or the induction fields produced by lightning, and are not required to be installed in ferrous conduit or have conductive armor for shielding. The use of fiber optic cables without a conductive shield or armor is permitted. Suppression components are not required for fiber optic cables.

a. Facility Entrance. The conductive armor of external fiber optic cables at the facility entrance point shall be bonded to the EES. Use 2 AWG bare copper conductor when bonding directly to the EES. When bonding connection to the EES uses an SPD, the

SPD bonding conductor shall be a 4 AWG stranded copper conductor insulated green with an orange tracer.

b. Facility Cabling. When the cable is internal to the facility and includes metallic electrically conductive sheaths or strength members, the sheaths shall be grounded to any SRS. When the electronic equipment is required to be isolated, bond the cable armor to the equipment SPG plate in accordance with section 5.5. To prevent circulating ground currents in the cable armor, an SPD located at one end of the cable may be used for grounding.

c. Transmitter and Receiver Modules. Fiber optic transmitter and receiver modules shall be contained in ferrous enclosures and bonded to the nearest SRS. Penetrations of the equipment enclosures shall be gasketed or constructed to limit RF coupling. SPDs for the metallic signal and power circuits shall be installed as equipment level protection at the fiber optic receiver or transmitter equipment entrance, and bonded to the equipment enclosure chassis. The transmitter and receiver modules shall have 90 dB of attenuation against EMI.

5.4.6 Interior Wiring, Conductors, and Cables

Permanent single conductors, cables and wiring shall be in ferrous raceway systems, such as RGS conduit, intermediate metal conduit (IMC), electrical metallic tubing (EMT) conduit, cable tray, or wireway, except when prohibited by NEC. Flexible metal conduit (FMC) is permitted when installed in accordance with FAA-C-1217.

Cable tray systems comprising single rail or wire construction are permitted where the installation of conventional ladder cable tray is impractical, provided the cable tray system meets the following requirements:

a. Suitable for use and classified by UL as an EGC.

b. Installed in accordance with manufacturer instructions to maintain the UL classification.

5.4.6.1 Metal-Clad Cable - Type MC

Type MC cable is permitted when installed in accordance with FAA-C-1217 and where all of the following conditions are met:

a. The MC cable shall include a steel armor of interlocking metal tape or sheath construction to form a ferrous magnetic exterior shield. MC cable with an aluminum exterior shield is prohibited.

b. Both ends of the MC cable shall be terminated using UL-listed compression fittings recommended by the OPR of this document.

c. The MC cable shall include a separate internal equipment grounding conductor or wire.

When MC cables are installed in MC cable tray, the following conditions shall be met:

a. The MC cable shall be UL-listed and marked suitable for use in metallic cable tray (hereinafter referred to as MC cable tray).

b. The MC cable tray shall be used exclusively for MC cable and type UL-listed raceways for power distribution.

c. The MC cable tray shall be separated from all other cable trays that transport non-axial communications, signal, and/or control cables or conductors by at least 12 in. The MC cable tray shall not carry more than 90 individual power branch circuits.

d. The MC cable bend radius shall be in accordance with the NEC and cable manufacturer installation instructions, but not less than 8 in.

5.5 Single Point Ground System (SPG) – Special Conditions

5.5.1 General

An SPG shall be provided when required by the electronic equipment or requested by the electronic equipment vendor. FAA facilities that do not use single-point-ground equipment are not required to install an SPG. The SPG shall be isolated from the power grounding system, the lightning protection system, MPG, or SRGG and SRGP systems, except at the main ground plate. The SPG shall be terminated at the main ground plate or to the EES, whichever is closer. The SPG shall be configured to minimize conductor lengths. Conductive loops shall be avoided by maintaining a trunk and branch arrangement as shown in Figure 20.

5.5.2 Isolation between SPG and Other SRS Systems

The minimum resistance between the SPG and the MPG, SRGG, or SRGP systems shall be 10 MΩ. The resistance shall be measured after the complete network is installed and before connection to the EES or SRS system at the main ground plate.

5.5.3 Resistance of Bonds

The maximum resistance of a bond connection from a conductor to a ground plate shall not be greater than 1 mΩ.

5.5.4 SPG - Ground Plates

Main, branch, and feeder ground plates shall be copper and at least 4 in. wide and 1/4 in. thick. The plates shall be mounted to nonconductive material of sufficient cross-section to rigidly support the plates after all conductors are connected. Bolts or other devices used to secure the plates in place shall be insulated or shall be of a nonconducting material. The plates shall be mounted in a manner that provides ready accessibility for inspection and maintenance.

See Table 4 for the single ground plate installation requirements.

5.5.5 SPG - Ground Conductors

Ground conductors shall be insulated copper conductors color-coded green with a yellow tracer.

5.5.5.1 Main SPG Conductor

Where an SPG is established directly from the EES, the SPG main conductor shall be an insulated 500 kcmil copper conductor not exceeding 50 ft in length. The main ground conductor shall be connected to the EES by an exothermic weld in accordance with paragraph 4.2.3.1.

5.5.5.2 Trunk and Branch Ground Conductors

Provide an insulated trunk ground conductor to interconnect all branch ground plates to the main ground plate as illustrated in Figure 20. Provide insulated copper branch ground conductors to interconnect feeder plates to branch ground plates. Conductor insulation shall be green with yellow tracer. Trunk and branch conductors shall be connected to ground plates by exothermic welds or UL-listed double-bolted connections in accordance with paragraph 4.2.3.4, and shall be mounted as shown on the facility drawings.

Trunk and branch conductors shall be routed using the shortest possible path.

a. Conductors Shorter than 400 ft. Trunk conductors shall be 4/0 AWG insulated copper conductors where the conductor length to the farthest feeder plate in the system is no more than 400 ft from the EES via the conductor runs.

b. Conductors Longer than 400 ft. For longer runs, select a conductor size to provide a cross-sectional area of 500 cmil per linear foot of conductor, but in no case that the conductor is smaller than 250 kcmil.

5.5.5.3 Electronic Equipment SPG Conductors

The conductor from the feeder ground plate (branch ground plate when there are no feeder ground plates in the conductor run) shall be connected to the isolated ground terminal or bus on the electronic equipment. This conductor shall be sized in accordance with Table 3.

5.5.5.4 Interconnections

Connections to the SPG shall be made on ground plates or buses. Split bolts and other connections to existing conductors are not allowed.

5.5.6 Labeling

The SPG shall be clearly labeled to preserve its identity as described in the following paragraphs.

5.5.6.1 Conductor Identification

SPG conductors shall be labeled in accordance with paragraph 4.7.3.1.6.

5.5.6.2 Ground Plate Labeling

Ground plates shall be installed according to Table 4.

5.5.7 Protection

Provide protection for conductors in the SPG subject to physical damage by use of conduit, floor trenches, routing behind permanent structural members, or other approved means. Single-point ground conductors shall be isolated from contact with any metal elements.

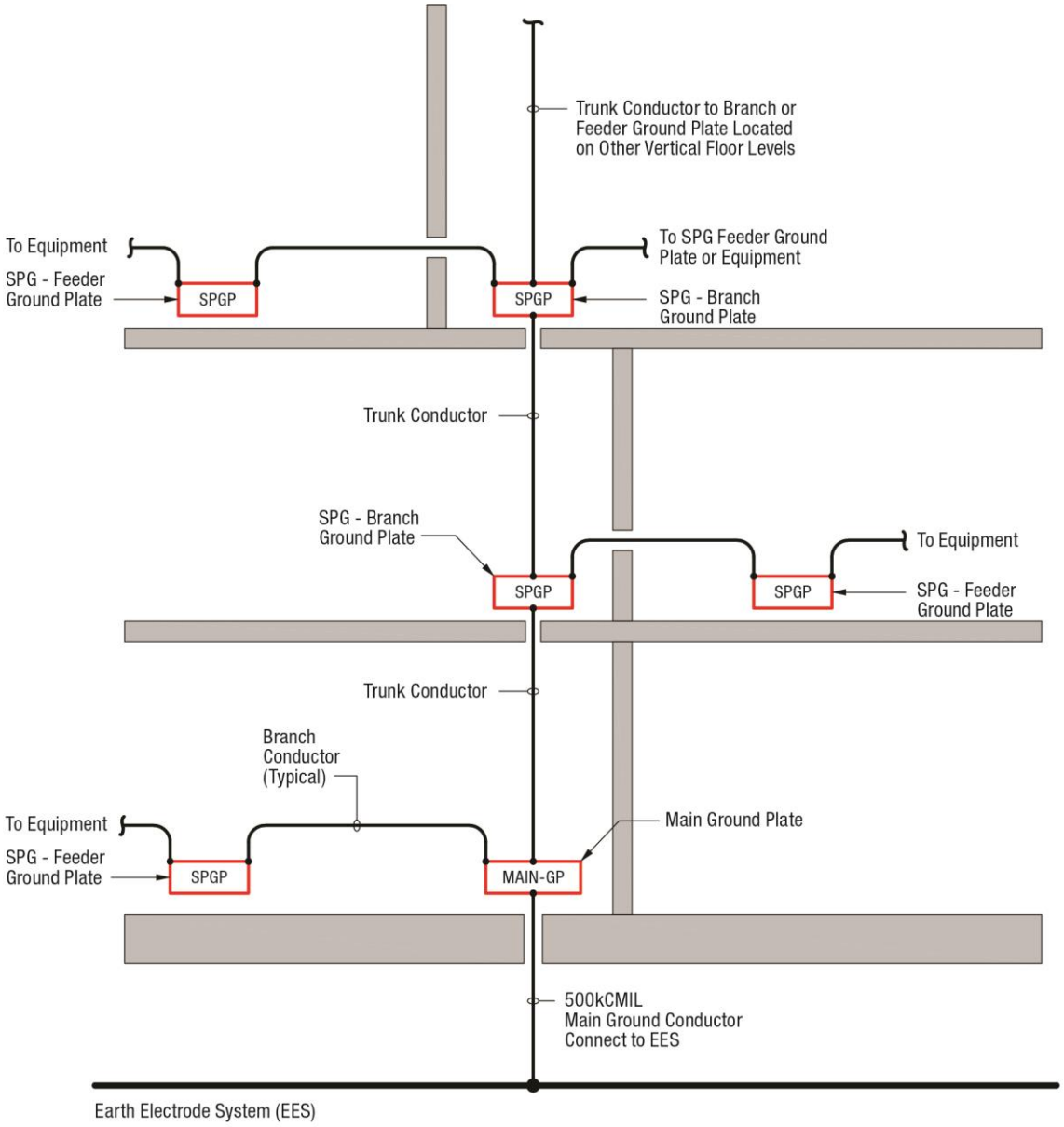


Figure 20. Single-Point Ground System Installation – Illustrative Example

5.6 NAS Electronic Equipment – Interface and Procurement Requirements

5.6.1 General

This section provides detailed performance and interface requirements for installation and procurement of NAS electronic equipment. Electronic equipment installed in NAS facilities shall comply with the requirements herein that address the following:

a. Electronic Signal Lines and Cables – Shielding

b. Signal, Control, and Data Line Entrance – Transient Protection

c. Equipment Power Entrance – Transient Protection

d. Electronic Equipment – Grounding and Bonding

e. Equipment – Signal Grounding and Bonding

f. Equipment Shielding Requirements

g. Circuit and Equipment ESD Design Requirements

5.6.2 Electronic Signal Lines and Cables - Shielding

Electronic signal lines shall be shielded twisted pairs with an insulated covering. Cables consisting of multiple twisted pairs shall have the individual shields isolated from each other. Cables shall have an overall shield with an overall insulated covering.

5.6.2.1 Electronic Signal Return Path

The electronic signal return path shall be routed with the circuit conductor. For axial circuits, the shield serves this purpose. The electronic equipment case and SRS shall not be used as a signal return conductor.

5.6.2.2 Termination of Individual Shields

Termination of individual shields shall be in accordance with paragraph 4.8.3.2.

5.6.2.3 Termination of Overall Shields

Termination of overall shields shall be in accordance with paragraph 4.8.3.3.

5.6.3 Signal, Control, and Data Line Entrance – Transient Protection

Procurement organizations are responsible for ensuring that electronic equipment, such as radars, NAVAIDS, and transmitters shall be provided with transient protection to reduce surges and transients to below the equipment transient susceptibility level. Signal, control, data line, and antenna cabling entrance transient protection shall be provided at the facility entrance point and at electronic equipment. Equipment SPDs shall be an integral part of the equipment, installed either internally or on the exterior of the equipment. Coordination of these protectors shall be addressed and completed in the system design stage and should not be delegated to field personnel during construction.

Equipment susceptibility level is defined as the transient level on the signal, control, or data lines that cause damage, degradation, or upset to electronic circuitry connected to the line. Transient protection for these lines is in addition to the facility transient protection levels specified in

paragraphs 5.7.2 through 5.7.4. Procurement organizations are responsible for ensuring that testing is performed to establish voltage, current, and energy levels that will damage components, shorten operating life, or cause operational upset to the equipment. These tests shall include electrical and electronic equipment components exposed to the effects of surges or transients.

The procurement organization shall ensure that facility and electronic equipment entrance transient protection is coordinated to limit transients at the equipment to below the equipment susceptibility level. Requirements of this paragraph shall be included in the comprehensive control and test plans included in paragraph 5.9.2. The following characteristics shall be evaluated:

a. Component Damage Threshold. The component damage threshold is the transient level that renders the component nonfunctional or operationally deficient. Voltage is usually the relevant parameter for solid-state components.

b. Component Degradation Level. The component degradation level is the transient voltage or energy level that shortens the useful life of the component.

c. Operational Upset Level. The operational upset level is the transient voltage or energy level that causes an unacceptable change in operating characteristics for longer than 10 milliseconds for analog equipment or a change of logic state for digital equipment.

5.6.3.1 Lines and Cables Requiring Protection

Surge protective devices shall be placed on both ends of signal, data, antenna, and control lines and cables longer than 10 ft where connecting pieces of electronic equipment are not located and bonded to the same SRS, or where the SRS ground system is located in different rooms or on different building floor levels, as illustrated in Figure 21. Electronic equipment shall be protected as specified in paragraph 5.6.3.

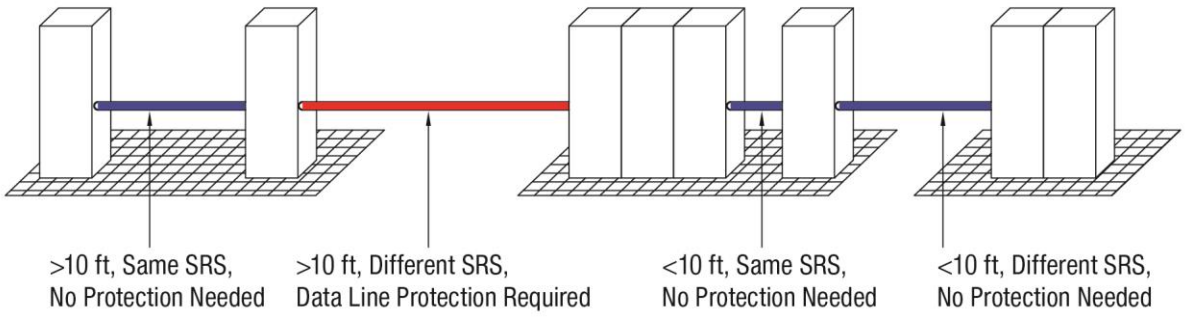


Figure 21. Lines and Cables Requiring Protection

5.6.4 Equipment Power Entrance – Transient Protection

SPDs, components, or circuits for the protection of electronic equipment power lines shall be provided by the equipment manufacturer as an integral part of electronic equipment mounted internally or on the exterior of the equipment at the cable entrance point. These devices shall be located at the ac power conductor entrance to electronic equipment housed in a shielded,

compartmentalized enclosure. SPDs at equipment shall provide a clamping level less than the equipment operational upset susceptibility level as defined in paragraph 5.6.3c and shall conform to Table 8, Table 9, and Table 10.

a. Maximum Continuous Operating Voltage (MCOV). The MCOV is the maximum rms voltage an SPD can withstand while operating continuously at maximum temperature without degradation or change to any of its parameters greater than +/-10 percent. The MCOV shall be at least 10 percent above the nominal system voltage, and leakage current, as defined below, shall not be exceeded.

b. Leakage Current. The dc leakage current shall be less than 1 mA for voltages at or below the dc voltage value of 1.414 x MCOV.

c. Clamping Discharge Voltage (CDV). The CDV is the maximum voltage that appears across an SPD output terminal while conducting surge currents. To ensure performance in the linear region without impacting the device lifetime performance, the CDV values measured at 3 kA for an 8/20 μs current impulse waveform shall not change more than 10 percent over the operating life of the SPD as defined in Table 10.

d. Overshoot Voltage. Overshoot voltage is the surge voltage level that appears across the SPD terminals before the device turns on and clamps the surge to the specified voltage level. Overshoot voltage shall not exceed two times the SPD clamping voltage for more than 10 ns.

e. Self-restoring Capability. The SPD shall automatically return to its off state after surge dissipation when line voltage returns to normal.

f. Operating Lifetime. The SPD shall safely dissipate the number and amplitude of surges listed in Table 10.

g. Fusing. The SPD overcurrent protection shall not increase the clamp voltage of the SPD and shall pass the surge current levels listed in Table 10 up to the 20 kA level without opening. Fusing shall be coordinated with the power source overcurrent protection scheme.

5.6.4.1 Slope Resistance

The purpose of this parameter is to establish a system that ensures SPD device coordination for equipment protection. The slope resistance R_{slope}, as calculated by the formula below, shall comply with Table 8:

$R_{slope} = (V_{10} - V_1)/9000$

Where V_{10} is the clamping voltage measured at 10 kA for an 8/20 μs waveform and V_1 is the clamping voltage measured at 1 kA for an 8/20 μs waveform.

The values of V_{10} and V_1 shall be based on actual measured values of SPD performance testing and not calculated values.

Table 8. Electronic Equipment Power Entrance SPD - Slope Resistance (R_{slope})

Location	Slope Resistance Value
Electronic equipment power entrance	60 mΩ minimum

5.6.4.2 SPD Voltage Protection Rating - V_3

SPD voltage protection rating shall be based on actual measured values of SPD performance testing and not calculated values. Voltages to be achieved during testing at 3 kA for an 8/20 µs current impulse waveform are shown in Table 9. All voltages shall be measured at the device terminals. The 8/20 µs waveform shall not lead or lag the voltage waveform by more than 30 degrees.

Table 9. Electronic Equipment Power Entrance SPD - Voltage Protection Rating (V_3)

Location	System Voltage (V)	SPD Voltage Protection Rating (V_3 per mode)	Limit
Electronic equipment power entrance	120/208 or 120/240	550 L-N, L-G 850 L-L	Minimum
	277/480	850 L-N, L-G 1350 L-L	Minimum
	380 Delta	1350 L-L, L-G	Minimum
	480 Delta	1350 L-L, L-G	Minimum

Table 10. Electronic Equipment Power Entrance SPD – Surge Current Lifetime Rating

Surge Current Level Amplitude with an 8/20 µs Waveform (see note 1) (kA)	Number of Surges Lifetime
1	100
10	25
20	1

Note:
1. Each level of surge current and the number of lifetime surges required represents a single lifetime of the SPD.

5.6.4.3 Electronic Equipment dc Power Supplies – Transient Protection

Procurement organizations are responsible for ensuring that equipment power supplies that use 60 Hz power to derive dc operating voltages for solid-state electronic equipment supporting the NAS shall have transient suppression components installed for each power supply output line. The suppression components shall be bonded to the protection equipment chassis. The chassis side of the suppressor enclosure shall be bonded to the rectifier output ground connection. The

suppressor should be located as close as possible to the rectifier grounding connection. Suppression components for power supply's rectifier output lines shall comply with following operating characteristics:

a. Operating Lifetime. Transient suppressors shall safely dissipate 1,000 surges at 200 A amplitude for a 1.2/50 μs current impulse waveform. Methods of testing shall be in accordance with the guidance in IEEE C62.45.

b. Limiting Voltage. Voltage shall be limited to a point 20 percent below the maximum peak inverse voltage (PIV) of the dc rectifier.

5.6.5 NAS Electronic Equipment Enclosures and Assemblies - Grounding and Bonding

Bonding connections for electronic equipment enclosures and assemblies shall be prepared and completed in accordance with the installation conditions and requirements provided herein.

5.6.5.1 Electronic Equipment Cabinets, Racks, and Cases

Cabinets, racks, and cases shall be provided with a grounding terminal or bus assembly whereby a bonding jumper or wire can be mechanically connected through an electrically conductive surface to the chassis frame. The metal enclosure of each individual unit or piece of electronic equipment shall be bonded to its cabinet, rack, or directly to the SRS or MPG system.

5.6.5.2 Equipment Enclosures - Isolated Grounding Receptacles

Isolated receptacles installed in accordance with the NEC are permitted for reduction of electrical noise. Isolated EGCs used for these receptacles shall be color-coded green with red and yellow tracers at each termination, and where passing through an enclosure without termination.

5.6.5.3 Portable Equipment (with Grounding Conductor)

Portable electrical or electronic equipment cases, enclosures, and housings shall be considered to be effectively grounded for fault protection through the EGC of the power cord, if positive continuity is provided between the case, enclosure or housing, and the receptacle ground terminal. The power cord EGC shall not be used for signal grounding.

5.6.5.4 Alternating Current Power Filters

Filter cases shall be bonded directly to the equipment case or enclosure in accordance with paragraph 5.6.5.5. Filter leakage current shall not exceed 5 mA per filter. Transient suppression devices, components, or circuits shall be installed in accordance with paragraph 4.6.3.

5.6.5.5 Electronic Equipment Enclosure Bonding

Where subassemblies and equipment are in physical contact with the equipment enclosure, they shall be bonded directly with the enclosure and mounting surfaces.

5.6.5.5.1 Enclosure Subassemblies for Equipment Mounting

Use the maximum possible contact area when bonding subassemblies to the equipment chassis. Raceway penetrations, filters, and connectors shall be bonded at the periphery to the subassembly enclosure to maintain shield effectiveness. Enclosure covers and mounting trim

shall be securely fastened to the enclosure. COTS equipment is considered a sealed unit and does not require additional internal bonding for the purposes of this requirement.

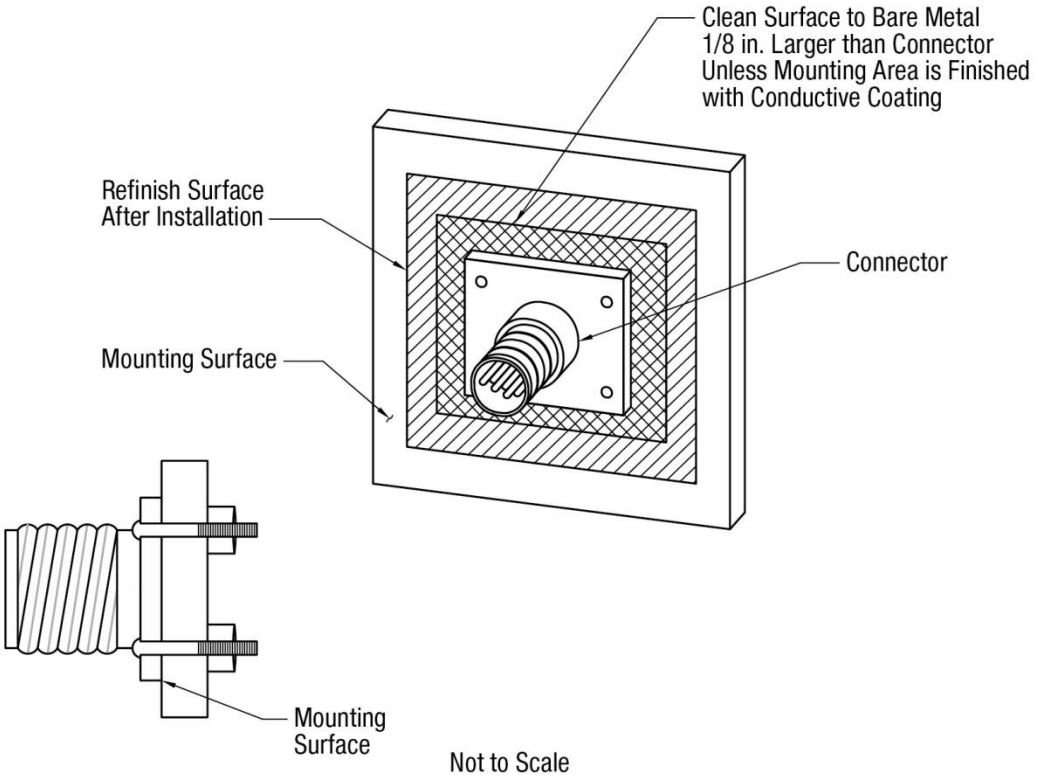
5.6.5.5.2 Electronic Equipment

The equipment chassis components shall be bonded together and directly to the rack, frame, or cabinet to which they are mounted. Clean flange surfaces and the bonding contact surface in accordance with paragraph 4.2.4.1. Fasteners shall maintain sufficient pressure to ensure surface contact to meet the bond resistance requirements in paragraph 4.2.1.1. Captive nuts, sheet metal screws, and tapping screws shall not be used for fasteners. If equipment operation is necessary when partially or completely withdrawn from its mounted position, the bond shall be maintained by an effective area of direct metal-to-metal contact or by the use of a flexible bonding strap. Mechanical designs shall employ direct bonding, without bonding jumpers, whenever possible.

Exception. *Self-drilling (tapping) metal screws are permitted to make a physical connection between metal back panels within equipment cabinet/enclosures for conditions where equipment access is not available to the opposite side of the bond connection.*

5.6.5.5.3 Connector Mounting

Connectors shall be mounted so that electrical contact is maintained between the connector body and the metal mounting panel. The connector flange shall be fastened to equipment enclosure to ensure direct contact between components for effective bonding. The connector flange surface and the enclosure contact area shall be cleaned in accordance with paragraph 4.2.4.1. Nonconductive material shall be removed from the contact area as illustrated on Figure 22. After mounting each connector, the completed bond shall be sealed and finished for corrosion protection in accordance with paragraph 4.2.4.3.



Notes:

1. The connection detail depicts an illustrative example and is exaggerated for clarity.

Figure 22. Bonding of Connectors to Mounting Surface

5.6.5.5.4 Shield Terminations

Cable shields shall be terminated in accordance with paragraphs 4.8.3.2 and 4.8.3.3. Axial cable shields shall be fastened to the cable connector shell with a compression fitting. A soldered connection is permitted to improve conductivity of the shielding joints in accordance with paragraph 4.2.3f. The cable shall withstand the anticipated use without degradation in shielding efficiency performance. Axial cable connectors shall be corrosion resistant in accordance with FAA-G-2100. Low frequency shields shall be soldered in place or, if solderless terminals are used, the compressed fitting shall afford maximum contact between the shield and the terminal sleeve. The cable shield casing shall be exposed less than 1 in. from the internal conductors of the cable as illustrated in Figure 13.

5.6.5.5.5 RF Gaskets

Conductive gaskets shall be corrosion resistant, electrically conductive to meet the resistance requirements of paragraph 4.2.1.1, and resilient to ensure the shielding effectiveness of the bond. Surfaces in contact with the gasket shall be smooth and free of insulating films, corrosion, moisture, and paint. The gasket shall be firmly affixed to the bonding surface by conductive cement and screw fasteners, a milled slot or other means that do not interfere with the effectiveness of the gasket. These methods shall prevent lateral movement or dislodging of the

gasket when the bond is disassembled. Gaskets shall be a minimum of 1/8-in. wide. The gasket and the contact surfaces shall be protected from corrosion.

5.6.6 NAS Electronic Equipment – Equipment Grounding and Bonding

5.6.6.1 Equipment Input and Output Electronic Signals

If a common signal reference is used, low-frequency analog input and output signals shall be balanced with respect to the signal reference. Maintain complete isolation between the SPG and the MPG, SRGG or SRGP system, except at the main ground plate or EES.

5.6.6.2 Multipoint Grounding of Electronic Equipment

Where permitted by circuit design requirements, internal ground references shall be bonded directly to the chassis and the equipment case. Where mounted in a rack, cabinet, or enclosure, the electronic equipment case shall be bonded to the racks, cabinet, or enclosure in accordance with paragraph 5.6.5.1. The dc resistance between any two points within a chassis or electronic equipment cabinet serving as ground shall be less than 25 mΩ total and not more than 2.5 mΩ per joint. Shields shall be provided where required for personnel protection and EMI reduction.

5.6.6.2.1 Prevention of Resonance in Bonding Straps

Due to resonance from a single bonding strap, two widely spaced straps of unequal length shall be used to connect equipment to the multipoint grounding bus in the equipment cabinet. Bonding connections shall be as short as possible and sized in accordance with Table 3.

5.6.6.3 Single-Point Grounding of Electronic Equipment

If electronic equipment performance necessitates an isolated SPG system for proper operation, then equipment and installation shall comply with the following:

a. SPG System. The SPG or plane shall be isolated from the electronic equipment case. If a metal chassis is used as the SPG, the chassis shall be floated relative to the case. The SPG system shall be designed such that electronic equipment SPG may be interfaced with other electronic equipment without compromising the system. Provide filtering if this SPG is required to be isolated from high frequencies.

b. SPG Conductor and Plate System. The system shall not form a conductive ground loop and it should be set up as a signal drain.

5.6.6.3.1 Single-Point Isolation of Input and Output Signal Requirements

The “high” and “low” sides of input and output signals shall be isolated from the electronic equipment case and balanced with respect to the signal reference. Operating and adjusting controls, readouts, indicating devices, protective devices, monitoring jacks, and signal connectors shall be designed to isolate both the high and low side of the signal from the case.

5.6.6.3.2 Single-Point Isolation of Case Requirements

The isolation between the SPG terminals and the case shall be 10 MΩ or greater with external power, signal, and control lines disconnected from the electronic equipment.

5.6.6.3.3 Equipment Power Input Isolation Requirements

The isolation between the SPG terminal and each power conductor (including ac neutral) shall be 10 MΩ or greater with the equipment power switch in the "on" position and the equipment disconnected from its power source.

5.6.6.3.4 Equipment Single-Point Ground Terminals

An insulated SPG terminal shall be provided on each electronic equipment case where an isolated signal reference is required. The SPG reference for the internal circuits shall be connected to the SPG terminal. This terminal shall be used to terminate cable shields as appropriate, and to connect the isolated signal ground of the electronic equipment to the SPG in the facility. A connector pin, screw, terminal strip, insulated stud, jack or feed-through, or an insulated wire are acceptable terminations if each terminal is clearly marked, labeled, or coded in a manner that does not interfere with its function. These marks, codes, or labels shall be permanently affixed and use green identification with yellow stripes. Wire insulation shall be green with a yellow tracer.

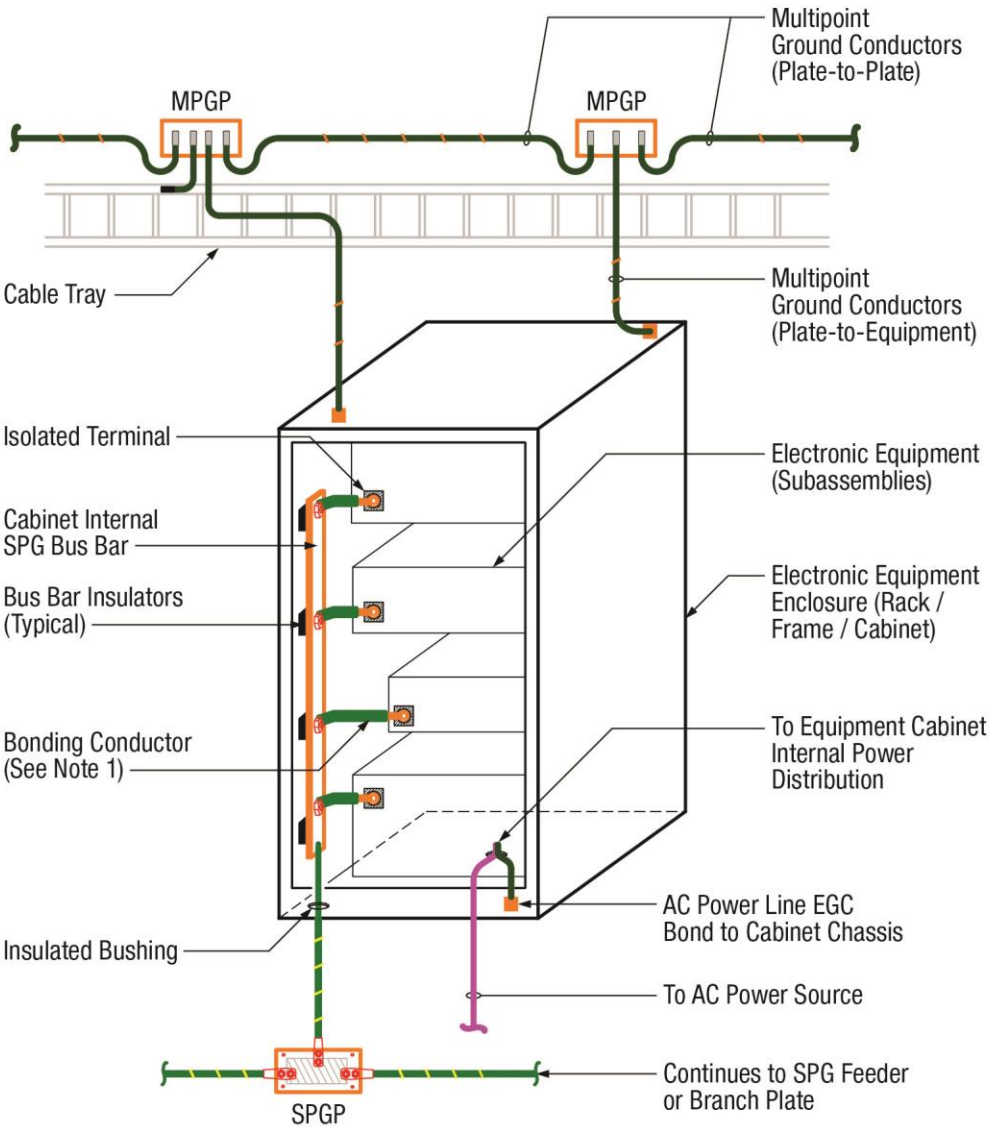
5.6.6.3.5 Connection of Electronic Equipment to the SPG

Each equipment SPG terminal shall be connected to the facility SPG in accordance with the following:

a. Individually Mounted Equipment. Individual units or pieces of electronic equipment that should not be mounted with other electronic equipment due to their location or function shall have an insulated copper conductor bonded from SPG terminal as specified in paragraph 5.6.6.3.4 to the nearest SPG system. This conductor shall be sized in accordance with Table 3.

b. SPG Bus Bar. If two or more units or pieces of electronic equipment are mounted together in a rack or cabinet, then a single-point ground bus bar shall be installed as shown in Figure 23. The bus bar shall be copper and shall provide a minimum cross-sectional area of 125,000 cmils, e.g., a 1x1/8-in. bus bar. The bus bar shall be drilled and tapped for No. 10 screws, and the holes shall be located as required by the relative location of the isolated SPG terminals on the electronic equipment. The bus bar shall be mounted on insulating supports that provide at least 10 MΩ resistance between the bus bar and the rack or cabinet.

c. Interconnecting SPG Terminals to SPG Bus Bar. Each electronic equipment isolated SPG terminal shall be interconnected to the SPG bus bar by means of a solid conductor of sufficient cross-sectional area to provide a maximum resistance of 5 mΩ, or a flexible tinned copper bond jumper sized in accordance with Table 3. The bond jumper shall be insulated or mounted in such a manner to maintain the required degree of isolation between the reference conductor and the enclosure. The bond jumper shall be connected to the equipment SPG bus bar at a point nearest the equipment SPG terminal in order to minimize the conductor length. An insulated copper conductor shall be installed from the equipment SPG bus bar to the nearest SPG grounding system as illustrated in Figure 23.



Note:

1. The conductor wire size for bonding conductors from electronic equipment to internal cabinet SPG bus bar shall be based on Table 3.

Figure 23. Single Point Ground Bus Bar Installation in Rack or Cabinet

5.6.7 Equipment Shielding Requirements

5.6.7.1 Control of Apertures

Unnecessary apertures shall be avoided. Only those shield openings required to achieve proper functioning and operation of the equipment may be provided. Controls, switches, and fuse holders shall be mounted such that metal-to-metal contact is maintained between the cover housing of the devices and the case. Metal control shafts shall be grounded in accordance with

paragraph 5.6.7.2. Close-fitting metal sleeves peripherally bonded to the case shall be provided only where nonconductive control shafts are necessary. The length of the sleeve shall be no less than four times its diameter. Lights shall be filtered or shielded as needed to maintain the required degree of shielding effectiveness. Openings provided for enclosure ventilation and moisture drainage shall be configured to maintain the effectiveness of the overall enclosure shielding.

5.6.7.2 Metal Control Shafts
Metal control shafts shall be grounded to equipment cases through a low impedance path provided by close-fitting conductive gaskets, metal finger stock, or grounding nuts.

5.6.7.3 Shielded Compartments
Shields shall be bonded to the chassis for fault protection in accordance with section 4.2.

5.6.7.4 Gaskets for Shielding Systems
Conductive gaskets conforming to paragraph 5.6.5.5.5 may be provided at joints, seams, access covers, removable partitions, and other shield discontinuities to the extent necessary to provide interference-free operation of the equipment under normal use and environmental conditions. Finger stock used on doors, covers, or other closures subject to frequent openings shall be installed in a manner that permits routine cleaning and maintenance.

5.6.7.5 Filter Integration
Filters on power, control, and signal lines shall be installed in a manner that maintains the integrity of the shield. Alternating current power filters shall be shielded completely with the filter case grounded in accordance with paragraph 5.6.5.4. Filters for control and signal lines shall be placed as close as possible to the point of penetration of the case to avoid long, unprotected paths inside the equipment.

5.6.8 NAS Electronic Equipment - Electrostatic Discharge Protection
ESD protection shall be provided in accordance with section 5.8.

a. Equipment Circuit Design and Layout. The design, layout, and packaging of assemblies, circuits, and components integrated into electrical and electronic equipment shall incorporate methods and techniques to reduce susceptibility to ESD.

b. Component Protection. External protection shall be provided for integrated circuits, discrete components, and other parts not having internal ESD protection that are inherently susceptible to ESD. Protective components shall be installed as close as possible to the ESD susceptible item.

c. ESD Withstand Requirements. In the installed and operational configuration equipment such as cabinets, enclosures, racks, controls, meters, displays, test points, and interfaces shall withstand a static discharge of 15,000 V in accordance with ANSI/ESDA/JEDECD JS-001, Standard for ESD Sensitivity Testing – Human Body Model (HBM). To successfully pass ESD testing requirements, the tested equipment shall not incur any operational upset, component, or assembly damage.

5.6.9 Secure Facilities

In areas of facilities required to maintain communications security, equipment and power systems shall be grounded in accordance with NACSIM-5203 and MIL-HDBK-232A.

5.6.10 High RF Field Bonding Requirements

FAA facilities that are located in proximity to other facilities that generate high RF levels need additional shielding to protect personnel and sensitive equipment from these external RF sources. When a determination is made that the signal level is sufficient to cause concern, incorporate the following requirements:

Metal building components and attachments such as walls, roofs, floors, door and window frames, gratings and other metallic architectural features shall be bonded directly to structural steel or to reinforcing bar if structural steel is not present. Where direct bonding is not possible, indirect bonds with copper conductor shall be used. Removable or adjustable parts and objects shall be grounded with an appropriate type bond strap. Metal building components with a maximum dimension of 3 ft or less are exempt from the requirements of this paragraph.

5.7 Surge Protective Device (SPD) – Equipment Specification Requirements

5.7.1 General

This section provides SPD performance requirements.

5.7.2 Surge Protective Device (SPD) for Power Distribution Equipment Protection

The SPD installation shall comply with the following:

a. Application Listing. The SPD shall be listed in accordance with the latest UL 1449 Standard for SPDs.

b. Integral Unit Mounted Assemblies. Panelboards and switchgear equipment with integral unit mounted SPD enclosures are permitted if the SPD and panelboard or switchgear integrated components are UL listed and recognized as an assembly.

c. Enclosure Rating. The SPD components shall be housed in a single steel enclosure, and classified by NEMA as type-12 for indoor use, or type-4 for indoor or outdoor use.

d. Enclosure Door Hardware. The enclosure door shall be hinged and electrically bonded with a bonding jumper connected to the enclosure. The internal components of the SPD, such as fusing, indicator lights, wiring, and protection elements, shall be accessible for inspection and replacement. The manufacturer's installation and maintenance instructions shall be provided with each SPD unit.

e. SPD Accessories. Indicator lamps shall be provided for each power phase on the SPD enclosure cover. The lamps shall indicate visually the normal condition when power is applied to the SPD with the component fusing intact. Lamps shall be provided at a minimum service life of 50,000 hours, otherwise two lamps per phase shall be provided.

f. Potting Material. The SPD enclosure shall be sealed at the power entry points with potting material in accordance with paragraph 4.6.2.3. The use of potting material within SPD components is prohibited, such that all SPD components are accessible at

all times for visual inspection, evaluation, maintenance, or replacement by qualified FAA personnel.

g. Conductor Terminations. Provide heavy-duty screw terminal studs or lugs for input and output conductor connections. The SPD phase and neutral terminals, when not connected, shall be electrically isolated from the enclosure by a minimum of 10 MΩ resistance measured at 100 Vdc.

5.7.2.1 SPD - Operational Requirements

The SPD equipment performance shall conform to Table 11, Table 12, and Table 13, and the following parameters:

a. Maximum Continuous Operating Voltage. The MCOV is the maximum rms voltage an SPD can withstand while operating continuously at maximum temperature without degradation or change to any of its parameters greater than +/-10 percent. The MCOV shall be at least 10 percent above the nominal system voltage. Leakage current, as defined below, shall not be exceeded.

b. Leakage Current. The dc leakage current shall be less than 1 mA for voltages at or below the dc voltage value of 1.414 x MCOV.

c. Clamping Discharge Voltage. The CDV is the maximum voltage that appears across an SPD output terminal while conducting surge currents. To ensure performance in the linear region without impacting the device's lifetime performance, the CDV values measured at 3 kA for an 8/20 μs current impulse waveform shall not change more than 10 percent over the operating life of the SPD as defined in Table 11.

d. Overshoot Voltage. Overshoot voltage is the surge voltage level that appears across the SPD terminals before the device turns on and clamps the surge to the specified voltage level. Overshoot voltage shall not exceed two times the SPD clamping voltage for more than 10 ns.

e. Self-restoring Capability. The SPD shall automatically return to its off state after surge dissipation when line voltage returns to normal.

f. Operating Lifetime. The SPD shall safely dissipate the number and amplitude of surges listed in Table 11.

g. In-line Inductors. In-line inductance is not permitted, except from the inductance normally created by the power connection conductors.

h. Overcurrent Protection. Fuses or circuit breakers that are part of an SPD installation shall be able to pass the surge currents specified in Table 11 without opening.

i. Short Circuit Current Rating. The SPD short circuit current rating shall be greater than the power distribution system available short circuit current where the equipment is applied in the power distribution system.

5.7.2.1.1 SPD Equipment Performance Data - Surge Current Levels

Table 11 defines the line-to-ground, line-to-neutral, neutral-to-ground, and line-to-line surge current values, and number of surge occurrences for ac power distribution SPD equipment operating below 600 V. In this table, the 8/20 μs waveform defines a transient reaching peak

value in 8 μs and decaying to 50 percent of peak value 20 μs after inception. These devices shall be able to tolerate surges of shorter duration without malfunction.

The following performance change measurements define SPD device failure modes. For the listed parameters, the clamping voltages for each device and assembly are measured at 1 kA and 10 kA for an 8/20 μs current impulse waveform.

a. Change in Clamping Voltage. Any change greater than 10 percent in the 8/20 μs clamping voltage at 3 kA during service or when the pre-life service test and post-life or in-service test results are compared is a device failure. The pre-life test value shall be taken as the 100 percent value.

b. Change in rms Voltage. Any change greater than 10 percent in the rms voltage required to drive 1 mA of rms current through the device when the pre-life service test and post-life or in-service test results are compared is a device failure. The pre-life test value will be taken as the 100 percent value.

c. Change in dc Voltage. Any change greater than 10 percent in the dc voltage required to drive 1 mA dc through the device when the pre-life service test and the post-life or in-service test results are compared is a device failure. The pre-life test value will be taken as the 100 percent value.

Table 11. Power Distribution Equipment SPD – Surge Current Lifetime Rating

Surge Current Level Amplitude with an 8/20 μs Waveform, See Note 1 (kA)	**Number of Surges** Lifetime for Any Facility Entrance SPD	**Number of Surges** Lifetime for Feeder and Branch Panelboard SPDs
10	1500	1000
20	700	500
30	375	250
40	50	25
50	8	1
60	6	N/A
70	4	N/A
100	2	N/A
200	1	N/A

Table Note:
1. Each level of surge current and the number of lifetime surges required represents a single lifetime of the SPD.

5.7.2.1.2 SPD - Slope Resistance

The purpose of this parameter is to establish a system that ensures SPD device coordination for equipment protection. The slope resistance R_{slope}, as calculated by the formula below shall comply with Table 12:

$R_{slope} = (V_{10} - V_1)/9000$

Where V_{10} is the clamping voltage measured at 10 kA for an 8/20 µs waveform and V_1 is the clamping voltage measured at 1 kA for an 8/20 µs waveform.

The values of V_{10} and V_1 shall be based on actual measured values of SPD performance testing and not calculated values.

Table 12. Power Distribution Equipment SPD - Slope Resistance (R_{slope})

Location	Slope Resistance Value
Any Facility Entrance	8 mΩ Maximum
Feeder and Branch Panelboards	30 mΩ +/- 15 mΩ

5.7.2.1.3 SPD - Voltage Protection Rating V_3

SPD voltage protection rating shall be based on actual measured values of SPD performance testing and not calculated values. Voltages to be achieved during testing at 3 kA for an 8/20 µs current impulse waveform are shown in Table 13. All voltages shall be measured at the device terminals. The 8/20 µs waveform shall not lead or lag the voltage waveform by more than 30 degrees.

Table 13. Power Distribution SPD Voltage (V_3) Protection Rating

Location	System Voltage (V)	SPD Voltage Protection Rating (V_3 per mode)	Limit
Facility Entrances	120/208 120/240	400 L-N, L-G 700 L-L	Maximum
	277/480	700 L-L, L-G	Maximum
	380 Delta	1200 L-L,L-G	Maximum
	480 Delta	1200 L-L, L-G	Maximum
Feeder and Branch Panelboards	120/208 120/240	475 L-N, L-G 775 L-L	+/- 45 V
	277/480	775 L-N, L-G 1275 L-L	+/- 45 V
	380 Delta	1275 L-L, L-G	+/- 45 V
	480 Delta	1275 L-L, L-G	+/- 45 V

5.7.3 SPDs for NAS Electronic Equipment – Design and Procurement Requirements

Provide surge protection for NAS electronic equipment in accordance with paragraph 5.6.3.

5.7.4 SPD - Design Specification for Axial Cable Protection

The design analysis for axial-type cable transient protection shall address the critical RFs and cable insertion losses. Axial cable protection shall comply with the following:

a. Testing. Performance testing shall be conducted to ensure that suppression components do not degrade signals or cause disruption to the electronic equipment.

b. RF Signal Testing Criteria. The analyses shall address cable impedance, insertion loss, phase distortion, and system voltage standing wave ratio.

c. Transient Protection for Electronic Equipment. SPD protection for coaxial, tri-axial, and twin-axial cables shall be provided at the facility entrance point and at the electronic equipment. The transient suppression shall be provided for each axial conductor and for shields that are not bonded directly to the electronic equipment chassis.

5.8 Electrostatic Discharge (ESD) Protection – Interface and Specification Requirements

5.8.1 General

This section provides performance and interface requirements for installation of ESD protective systems. ESD controlled areas shall be provided for operations, storage, repair, and maintenance spaces used for electrical and electronic equipment or subassemblies that are subject to damage from static electricity or ESD. NAS electrical and electronic equipment, subassemblies, and components subject to damage from exposure to electrostatic fields or ESD shall be protected as indicated herein. Approval of any exception to the guidance herein shall be by the OPR.

The requirements of this section are designed to reduce frequency and minimize effects of ESD events. Electronic circuitry that contains miniaturized or solid-state components shall be considered ESD susceptible.

5.8.2 Electrostatic Discharge (ESD) Sensitivity Classification

Classification of items as ESD sensitive shall be in accordance with the HBM testing procedures and requirements of ANSI/ESDA/JEDECD JS-001. Electronic parts, components, and assemblies shall be classified as either sensitive or supersensitive. Items that fail from ESD at 1,000 to 16,000 V shall be classified as ESD sensitive. Items that fail below 1,000 V shall be classified as supersensitive. Devices with a sensitivity of less than +/- 200 V require additional ESD protection measures beyond those specified in this standard. ESD susceptible items shall not be exposed to an electrostatic field greater than 100 V/m, nor located within 24 in. from known static generators or nonessential insulated materials.

5.8.3 Classification of Materials

Most materials and products that are used to control and prevent ESD are classified by their resistive properties as conductive or static dissipative. Antistatic materials are classified by their ability to avoid generating static electricity from triboelectric charging.

Materials used for construction of ESD protected areas (with the exception of antistatic materials) shall meet the resistive properties specified for type and use of the material.

5.8.3.1 Static Conductive Materials

Those materials with a surface resistivity less than 1.0×10^5 ohms per square when tested per ANSI/ESD STM11.11 shall be considered conductive. Conductive ESD control materials shall not be used for ESD control work surfaces, tabletop mats, floor mats, flooring, or carpeting where the risk of personnel contact with energized electrical or electronic equipment exists. Conductive ESD control materials shall not be used in any other application where their use could result in EMI or radio frequency interference (RFI) that would be created by rapid, high-voltage ESD spark discharges.

5.8.3.2 Electrostatic Shielding Materials

Electrostatic shielding materials are a subset of conductive materials with a surface resistance equal to or less than 1.0×10^3 ohms when tested per ANSI/ESD STM11.11. Electrostatic shielding materials are permitted as barriers for protection of ESD sensitive items from electrostatic fields.

5.8.3.3 Electromagnetic Shielding Materials

Electromagnetic shielding materials with highly conductive surfaces less than 10 ohms, or composite materials that absorb and reflect electromagnetic radiation over a broad range of frequencies, are permitted for protection of ESD sensitive items from electromagnetic fields.

5.8.3.4 Static Dissipative Materials

Materials with a surface resistivity greater than 1.0×10^5 ohms per square but less than or equal to 1.0×10^{12} ohms per square when tested per ANSI/ESD STM11.11 are classified as static dissipative materials. Static dissipative materials with a surface resistance less than or equal to 1.0×10^9 ohms shall provide controlled bleed-off of accumulated static charges in ESD controlled areas. Static dissipative materials with a surface resistance of greater than 1.0×10^9 ohms are not permitted for applications where controlled bleed-off of accumulated static charges is required.

5.8.3.5 Antistatic Materials

Materials that inhibit or have a low propensity to generate static electricity from triboelectric charging shall be considered antistatic. Antistatic ESD control items and materials used for construction of ESD controlled areas shall not tribocharge to greater than +/-200 V when being used for their intended application. Antistatic materials with a surface resistance greater than 1×10^9 ohms shall not be used for ESD protective work at surfaces, tabletop mats, floor mats, flooring, and carpeting when charge dissipation is the primary consideration. If the surface resistance (R_{tt}) of an antistatic material is greater than 10^{12} ohms, it shall be considered too resistive for use in ESD controlled areas. Use of antistatic items and materials that use hygroscopic surfactants that depend on ambient humidity to promote absorption of water is discouraged. Only antistatic materials that are intrinsically antistatic and retain their antistatic properties shall be used in ESD controlled areas.

5.8.3.6 Static-Generative Materials, Nonconductors, and Insulators

Materials having a surface resistance greater than 1.0×10^{12} ohms (ANSI/ESD STM11.11) shall be considered to be insulators and a potential source of triboelectric charging. These materials include common plastics, Plexiglas, Styrofoam, Teflon, nylon, rubber, untreated polyethylene, and polyurethane. Use of these materials shall be minimized where ESD sensitive items are located.

5.8.4 Hard and Soft Grounds

5.8.4.1 Hard Grounds

Any item, material, or product that is a part of the ESD control system that is intentionally or unintentionally connected to an ESD ground, or connected directly to any SRS in the area served, but not to an SPG system, shall be considered to be hard grounded. Unless specified otherwise or approved by the OPR, all items that comprise the ESD control system shall be hard grounded, such as worksurfaces, cabinets, flooring, carpeting, and test equipment.

5.8.4.2 Soft Grounds

A soft ground is an intentional connection to ground through a series current limiting resistor. Soft grounding shall only be used for personnel grounding skin contact devices, such as wrist straps, leg or ankle straps, conductive shoes, and heel or toe grounders. The nominal resistance of the resistor used for soft grounding of personnel shall be greater than 1.0×10^6 ohms unless otherwise approved by the OPR. All other elements of the ESD control system shall be hard grounded.

5.8.5 Protection of Electrostatic Discharge (ESD) Susceptible and Sensitive Items

5.8.5.1 Static Protected Zone

A static protected zone shall be a volume or area where there is no direct contact between unprotected ESD sensitive items and electrostatic potentials greater than +/-200 V, electrostatic fields greater than 100 V/m, or radiated EMI and RFI produced by rapid high-voltage ESD spark discharges. Static protected zones shall be incorporated into the construction of ESD special protection areas, ESD protected storage areas, and ESD protected workstations.

5.8.5.2 ESD Special Protection Areas

Special protection areas shall be designated areas that require the following ESD control measures:

a. Minimize triboelectric charging.

b. Control bleed-off and dissipation of accumulated static charges.

c. Neutralize charges.

d. Minimize the effects of e-fields, h-fields, and EMI/RFI from ESD spark discharges.

Areas within a facility that shall be designated as ESD special protection areas are:

a. Air Traffic Operations Areas. These include tower cab, TRACON, ARTCC control rooms, and automated flight service station (AFSS) areas.

b. Electronic Equipment Rooms.

c. Storage Areas. Areas to store ESD-susceptible components such as subassemblies and circuit cards.

d. Computer/LAN Interface Areas. Areas that contain personal computers and LANs that are connected to or interface directly with NAS electronic equipment.

e. Other Locations. Locations where jacks, plug-in connectors, or interfaces of ESD sensitive electronic equipment are exposed and vulnerable to ESD damage by direct human contact.

5.8.6 ESD Controls Required for ESD Special Protection Areas

The following ESD control measures shall be implemented in areas designated as ESD special protection areas.

5.8.6.1 ESD Groundable Point (GP)

Each ESD control material, surface, or item used in an ESD controlled area shall have a designated GP to provide ease of connection to the nearest SRS.

5.8.6.2 Grounded Static Dissipative Surfaces

Work surfaces which include work surface laminates, paints and sealers, writing surfaces, tabletops, consoles, ESD protected workbenches, and tabletop mats shall be static dissipative and connected to an SRS in the area served, but not to an SPG system. The point-to-point resistance and surface-to-ground resistance of static dissipative work surfaces shall be greater than 1.0×10^6 ohms and less than 1.0×10^9 ohms (ANSI/ESD S4.1).

5.8.6.3 Limiting the Use of Non-ESD Control Materials

Materials that will tribocharge, i.e., generate electrostatic potentials by contact and separation with themselves or other materials, shall not be used for construction in ESD special protection areas. Insulative materials and any other non-essential triboelectric charge generators that generate potentials in excess of +/-200 V are not permitted within 24 in. of ESD special protection areas.

5.8.6.4 Static Dissipative Chairs

Chairs provided for ESD special protection areas shall incorporate a continuous path between chair elements, such as the cushion and arm rests, to the ground points in the range of greater than 1.0×10^5 ohms to less than 1.0×10^9 ohms. The ground points for ESD chairs shall be static dissipative or conductive casters that provide electrical continuity from all elements of the chair to ESD control carpeting, tile, or floor mats. These ground points shall be properly bonded to any SRS in the area, but not to an SPG system. ESD control chairs shall be tested and meet the requirements of ANSI/ESD STM12.1.

5.8.6.5 Static Dissipative ESD Control Floor Coverings

Static dissipative ESD control floor coverings shall include static dissipative tile, carpeting, static limiting floor finishes, and floor mats. Floor coverings in ESD special protection areas shall have a point-to-point resistance and surface-to-ground resistance of greater than 1.0×10^6 ohms and less than 1.0×10^9 ohms (ANSI/ESD STM 7.1). These floor coverings shall be bonded to any SRS in the area served in accordance with paragraphs 5.8.6.1 and 5.8.9, but not an SPG system.

In circumstances involving extremely static sensitive equipment, a static conductive floor covering with a lower resistance limit of 2.5×10^4 ohms (UL 779) shall be provided when it is part of a system designed for ESD control for the equipment. The system design shall meet all requirements of this standard to produce an electrically safe working environment, and be approved by the OPR.

5.8.6.6 Relative Humidity Control

Relative humidity in ESD special protection areas shall be maintained within the range of 40 to 60 percent.

5.8.7 ESD Signs, Labels, Cautions, and Warnings for ESD Protection Areas

ESD warning signs shall be posted in ESD special protection areas and other ESD controlled areas. Sign labels shall be marked with an ESD sensitive electronic device warning symbol and other warning and caution labeling information appropriate for personnel safety. ESD warning signs shall be colored yellow with black marking labels and lettering. ESD signs for exterior cabinets housing ESD sensitive electronic equipment shall be visible from at least 3 ft. The sign and labeling style and format shall be consistent, and comply with ANSI/ESD S8.1.

5.8.8 Electrostatic Discharge (ESD) Protective Storage Areas

5.8.8.1 Shelves, Bins, and Drawers

Shelves, bins, and drawers shall be static dissipative and electrically continuous with the support structure for the storage shelves, bins, or containers.

5.8.8.2 Grounding

The storage container metal support structure shall have a GP connected to the nearest SRS in the area, but not to an SPG system. The resistance from the ground point of storage containers, shelving, cabinets, and bins used to store ESD sensitive items to the nearest SRS shall be less than 1 ohm.

5.8.8.3 Personnel Grounding

Wrist straps shall be equipped with 1 megohm or greater series resistance to protect personnel. Standard 0.157-in. banana jacks for personnel grounding wrist straps shall be connected to the ESD ground or directly to any SRS in the area served, but not to an SPG system. The resistance between the banana jack and the GP, and the GP to the nearest SRS, but not to an SRS system, shall be less than 1 ohm.

5.8.8.4 Materials Prohibited in ESD Protective Storage Areas

Static generative insulators materials are prohibited for construction in areas where ESD sensitive items will be stored. Materials that can generate potentials greater than +/-200 V shall be located a minimum of 24 in. from ESD protected storage areas.

5.8.8.5 Resistance to ESD Ground for Shelves, Drawers, and Bins

Surfaces and drawers of storage media shall be composed of static dissipative materials and shall conform to the resistance testing requirements for worksurfaces (ESD S4.1). The surface-to-surface resistance (R_{tt}) and surface-to-ground resistance (R_{tg}) from the shelves, bins, and drawers of storage containers used to store unprotected ESD sensitive items shall be greater than 1.0×10^6 ohms and less than 1.0×10^9 ohms (ESD ADV53.1).

5.8.8.6 Identification of ESD Protective Storage Areas

Boundaries of ESD protective storage areas shall be clearly identified. Boundaries of ESD protective storage areas shall extend a minimum of 24 in. beyond the area where ESD sensitive items are located and marked with yellow tape. Highly visible ESD warning signs that are colored yellow with black markings and lettering shall be posted at entrances to these areas. Signs shall include an ESD sensitive electronic device warning symbol and other warning and caution labeling information for personnel safety.

5.8.9 Electrostatic Discharge (ESD) Control Flooring and Floor Coverings

ESD control floors and floor coverings shall have a point-to-point resistance and a surface-to-ground resistance of greater than 1.0×10^6 ohms and less than 1.0×10^9 ohms (ANSI/ESD STM7.1). ESD control flooring, floor coverings, and floor tile laminates include materials such as vinyl tile, vinyl sheet, carpet, carpet tile, and carpet tile with positioning buttons, but not the applied coatings on the material.

ESD control floors and floor coverings shall be installed, grounded, and initially tested by trained installers in accordance with the manufacturer's recommendations. A representative 10-ft-square section of the flooring system shall be tested and approved by the FAA personnel prior to installation of the full flooring system.

ESD control floors and floor coverings shall be bonded to the nearest SRS in the area served, but not to an SPG system, at a minimum of four locations. The installation methods and testing shall be in accordance with the manufacturer's installation recommendations.

5.8.9.1 Surface Resistance (R_{tt})

Surface resistance R_{tt} of ESD control floors, carpets, or floor mats shall be greater than 1.0×10^6 ohms and less than 1.0×10^9 ohms (ANSI/ESD STM7.1). The system surface resistance shall be validated by testing. A minimum of five readings shall be taken at different locations on the floor surface and averaged together for each 500 ft^2, or fraction thereof, equivalent floor surface. These readings shall be recorded and documented in the Facility Reference Data File (FRDF).

5.8.9.2 Resistance Surface-to-Ground (R_{tg})

Resistance from the floor surface-to-ground R_{tg} of ESD control floors, carpets or floor mats shall be greater than 1.0×10^6 ohms and less than 1.0×10^9 ohms (ANSI/ESD STM7.1). The system shall be validated by testing. A minimum of five readings shall be taken at different locations on the floor surface and averaged together for each 500 ft^2, or fraction thereof, equivalent floor surface. These readings shall be recorded and documented in the FRDF.

5.8.9.3 Triboelectric Charging Limitation

ESD control floors, carpets, or floor mats shall limit and control generation and accumulation of static charges to less than +/-200 V in ESD controlled areas.

5.8.10 Electrostatic Discharge (ESD) Requirements for Raised Access Floor Systems

5.8.10.1 Resistance between Carpet Surface to Pedestal and Support Substructure

The resistance between carpet tile surface and the raised access floor pedestal and panel support substructure shall be greater than 1.0×10^6 ohms and less than 1.0×10^9 ohms.

5.8.10.2 Contact Resistance between Panel to Access Floor Support Substructure

The contact resistance between the access floor panel system metal parts and the floor substructure shall be less than 10 ohms.

5.8.10.3 Carpet Tile Installation on Raised Access Floor Panels

Install individual carpet tiles on raised floor panels with either permanent or releasable conductive adhesive depending on the application.

5.8.10.4 Grounding of Raised Access Floor System

A minimum of four connections shall be provided per 1,000 ft^2 of installed ESD control carpeting from the carpeting undersurface and conductive adhesive to the raised access floor panel support substructure. The connections and installation method shall be in accordance with the manufacturer's recommendations, and the testing requirements of paragraphs 5.8.10.1 and 5.8.10.2.

5.8.11 Electrostatic Discharge (ESD) Protective Worksurfaces

All worksurfaces, including consoles and ESD-protected workstations and writing surfaces in all areas designated as ESD special protection areas and static-safe zones shall be static dissipative materials or electrostatic dissipative laminates.

5.8.11.1 Requirements for ESD Protective Worksurfaces

Static dissipative worksurfaces shall be provided for new or upgrade facilities unless otherwise specified. Permanent static dissipative worksurfaces shall be connected to any SRS in the area served, but not to an SPG system. Permanent ESD protective static dissipative worksurfaces shall have a resistance greater than 1.0×10^6 ohms point-to-point (R_{tt}) and less than 1.0×10^9 ohms (ESD S4.1). Permanent ESD protective worksurfaces shall have a resistance from their surface to the groundable point (R_{tg}) greater than 1.0×10^6 ohms and less than 1.0×10^9 ohms (ESD S4.1).

5.8.11.2 Worksurface Types

ESD protective worksurfaces used for ESD protected workstations shall meet the requirements of MIL-PRF-87893 *Performance Specification, Workstation, ESD Control*, and MIL-W-87893 *Military Specification, Workstation, ESD Control*.

5.8.11.2.1 Type I Worksurface - Hard

Type I worksurfaces shall be constructed of rigid static dissipative materials of any color having an average Shore D hardness in excess of 90. Two male or female 0.395-in. ground snap (female) or stud (male) fasteners shall be installed on both corners on one of the longest sides of the worksurface to accommodate the male or female snap or stud fastener of the common point grounding cord. The locations of the two snaps or studs shall be 2 in. from each corner.

5.8.11.2.2 [A5] Type II Worksurface - Soft

Type II worksurfaces shall be constructed of cushioned static dissipative materials of any color having an average Shore A (ATSM D2240) hardness between 45 and 85. Two male or female 0.395-in. ground snap (female) or stud (male) fasteners shall be installed on both corners on one of the longest sides of the worksurface to accommodate the male or female snap or stud fastener of the common point grounding cord. The locations of the two male or female snaps or studs shall be 2 in. from each corner. Low-density open-cell materials are not permitted for Type II worksurfaces.

5.8.11.3 Static Dissipative Laminates

High-pressure, multilayer static dissipative laminates shall be used to cover surfaces such as plywood, fiber board, particle board, benchtops, countertops, and consoles in ESD controlled areas and special protection areas. Laminates shall include a buried conductive layer to provide for ease of grounding using a through-bolt pressure-type ESD grounding terminal.

5.8.11.4 Grounding of Laminated Surfaces

The resistance across the surface (R_{tt}) of the static dissipative laminate shall be greater than 1.0×10^6 ohms and less than 1.0×10^9 ohms. The resistance from the surface of the laminate to ground (R_{tg}) shall be greater than 1.0×10^6 ohms and less than 1.0×10^9 ohms (ESD S4.1). The system shall be validated through testing. A minimum of five readings of each shall be taken and averaged together. These readings and averages shall be recorded in the FRDF.

5.8.12 Static Dissipative Coatings

Permanent clear or colored static dissipative coatings used in ESD controlled areas, including painted surfaces, shall have a point-to-point resistance greater than 1.0×10^6 ohms and less than 1.0×10^9 ohms.

5.8.13 Electrostatic Discharge (ESD) Protected Workstations

ESD protected workstations are workbenches used for the maintenance and repair of ESD sensitive equipment.

5.8.13.1 ESD Protected Workstation Minimum Requirements

ESD control items at an ESD protected workstation shall be connected to a common ESD system GP and bonded to any SRS in the area served, but not to an SPG system. ESD protected workstations shall be free from all nonessential static charge generators, and provide a means of personnel grounding. Workstations shall have a grounded static dissipative work surface, and grounded static dissipative ESD control floor or mat. Storage containers located at ESD protected workstations shall be provided with ESD protection and connected to the ESD system GP. Power outlets for ESD protected workstations shall be protected with a ground fault circuit interruption (GFCI) device to minimize the risk of electrical shock to grounded personnel.

5.8.13.2 Use of Ionization

Selective use of benchtop or area ionizers is permitted at ESD-protected workstations if static generative insulator items are deemed essential and cannot be removed from the ESD protected workstation area, or the grounding of mobile personnel is not possible or creates a safety hazard.

5.8.13.3 Identification of ESD Protected Workstations

Boundaries of ESD protected workstations shall be clearly identified with highly visible ESD warning signs. Boundaries of ESD protected workstations shall be identified with yellow tape marking labels. The ESD boundary shall extend a minimum of 24 in. beyond the area where ESD sensitive items are located.

ESD warning signs shall be posted in ESD special protection areas and other ESD controlled areas. Sign labels shall be marked with an ESD sensitive electronic device warning symbol and

other warning and caution labeling information appropriate for personnel safety. ESD warning signs shall be colored yellow with black marking labels and lettering.

5.9 Electromagnetic Compatibility Requirements

5.9.1 General

A comprehensive plan for the application of this standard is required to ensure the compatible operation of equipment in complex systems. Considerations in this section shall be implemented to reduce susceptibility to emissions of electronic equipment.

5.9.2 [A6] Requirements

The emission and susceptibility limits contained in MIL-STD-461 shall be applied unless otherwise specified. An electromagnetic interference (EMI) Control and Test Plan shall be developed in accordance with MIL-HDBK-237 to ensure compliance with the applicable requirements. The plan shall include a verification matrix to track the satisfaction of requirements by test, analysis, or inspection.

5.9.3 Approval

Control and Test Plans shall be submitted to the OPR for approval.

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6 NOTES

6.1 Acronyms and Abbreviations

The following are acronyms and abbreviations used in this standard.

A		
	A	Ampere
	ac	alternating current
	AFSS	automated flight service station (FAA Acronym)
	ANSI	American National Standards Institute
	ARTCC	Air Route Traffic Control Center
	ASSC	airport surface surveillance capability system
	ATCT	Airport Traffic Control Tower
	AWG	American Wire Gauge
C		
	CDV	clamping discharge voltage
	cmil	circular mils
	COTS	commercial off-the-shelf
D		
	dB	Decibel
	dc	direct current
	DEB	direct earth burial
	diam	Diameter
E		
	e.g.	for example
	EES	earth electrode system
	EGC	equipment grounding conductor
	EMI	electromagnetic interference
	EMT	electrical metallic tubing
	ESD	electrostatic discharge
	et al.	and others
	etc	et cetera
F		
	FAA	Federal Aviation Administration
	FRDF	facility reference data file (FAA Acronym)
	ft	foot (feet)
G		
	GEC	grounding electrode conductors
	GFCI	ground fault circuit interruption
	GP	groundable point
H		
	Hz	hertz
	HBM	human body model

I		
	i.e.	that is
	IFR	Instrument Flight Rules (FAA Acronym)
	IMC	intermediate metal conduit
	in.	inch
	IEEE	Institute of Electrical and Electronics Engineers
K		
	kA	kiloampere
	kcmil	thousand circular mils
	kHz	kilohertz
L		
	LAN	local area network
	lb	pound
	LPGBS	Lightning Protection, Grounding, Bonding and Shielding
	L-G	Line-to-Ground
	L-L	Line-to-Line
	L-N	Line-to-Neutral
	LLWAS	low level wind shear alert system (FAA Acronym)
M		
	m	meter
	mm	millimeter
	mA	milliampere
	mΩ	milliohm
	MΩ	megohm
	MCOV	Maximum continuous operating voltage
	MHz	megahertz
	MPG	multipoint ground system
	MPGP	multipoint ground plate
	µs	microsecond
N		
	NAS	National Airspace System
	NAVAIDS	navigation aids
	NEC	National Electrical Code
	NEMA	National Electrical Manufacturers Association
	NFPA	National Fire Protection Association
	ns	nanosecond
O		
	OCPD	overcurrent protective device
	OM	outer marker (FAA Acronym)
	OPR	Office of Primary Responsibility
	Ω	ohm
P		
	PIV	peak inverse voltage
	PVC	polyvinyl chloride

R		
	RF	radio frequency
	RGS	rigid galvanized steel
	RFI	radio-frequency interference
	RMC	rigid metal conduit
	rms	root-mean-square
	R_{slope}	slope resistance
	R_{tg}	surface-to-ground resistance
	R_{tt}	surface resistance
	RVR	runway visual range (FAA Acronym)
S		
	SDM	service disconnecting means
	SPD	surge protective device
	SPG	single point ground system
	SPGP	single point ground plate
	SRGG	signal reference ground grid
	SRGP	signal reference ground plane
	SRM	safety risk management
	SRS	signal reference structure
	SSC	system support center (FAA Acronym)
T		
	TELCO	telephone company (FAA Acronym)
	ton	unit of mass or weight
	TRACON	terminal radar approach control facility
	TVSS	transient voltage surge suppressors
U		
	UL	Underwriters Laboratories
	UPS	uninterruptible power supply
V		
	V	volt
	V_{dc}	volts direct current
	VOR	very high frequency (VHF) omni directional range (FAA Acronym)
W		
	λ	Frequency Wavelength

6.2 Guidelines and Reference Notes

[A1] **Paragraph 4.2.1.1**
See FAA-HDBK-010 for evaluation, inspection, and testing procedures.

[A2] **Paragraph 4.2.3.4.1**
See MIL-STD-889, paragraphs “Precautions and methods for joining” and “Recommended Treatments in Order of Protective Effectiveness” for additional guidance for completing bond joints where base metals for couples are not permitted in Table 1.

[A3] **Paragraph 4.4.2**
The site survey geotechnical investigation data and EES design configuration are expected to be documented and retained within the facility’s as-built documentation set, in accordance with FAA Order 630.45, Facility Reference Data File.

[A4] **Paragraph 4.4.4.4**
Access wells located in nontraffic areas should be medium duty rated per AASHTO H-20 design load criterion up to 40,000 lb. Access wells subject to vehicular traffic should be traffic rated per AASHTO M306 proof loading criterion up to 100,000 lb. Access wells subject to aircraft loading should be Airport rated per AASHTO M306 proof loading criterion up to 200,000 lb.

[A5] **Paragraph 5.8.11.2.2**
Guidance for measurement of material hardness properties is in ATSM-D2240, Standard Test Method for Rubber Property - Durometer Hardness, ASTM International, West Conshohocken, PA, 2015, www.astm.org.

[A6] **Paragraph 5.9.2**
Guidance for EMI protection is in MIL-HDBK-253, and for ESD in NFPA 77, DODHDBK-263, DOD-STD-1686, and IEEE 1100.

6.3 Version Cross-Reference

Due to the major reorganization of FAA-STD-019F it is not feasible to provide an exact cross-reference between this standard and the previous versions of FAA-STD-019. The OPR should be consulted for assistance in determining references to the original requirements in previous editions of FAA-STD-019.

6.4 Bibliography

[B1] NFPA 70, National Electrical Code, National Fire Protection Association, Current Edition.

[B2] NFPA 75, Standard for the Fire Protection of Information Technology Equipment, National Fire Protection Association, Current Edition.

[B3] NFPA 780, Standard for the Installation of Lightning Protection Systems Handbook, National Fire Protection Association, Current Edition.

[B4] IEEE 1100, IEEE Recommended Practice for Powering and Grounding Electronic Equipment, Institute of Electrical and Electronics Engineers, Inc., Current Edition.

[B5] IEEE C2, National Electrical Safety Code, Institute of Electrical and Electronics Engineers, Inc., Current Edition.

[B6] MIL-HDBK-419, Department of Defense, Military Handbook: Grounding, Bonding, and Shielding for Electronic Equipments and Facilities, Volume I, Current Edition.

[B7] MIL-HDBK-419, Department of Defense, Military Handbook: Grounding, Bonding, and Shielding for Electronic Equipments and Facilities, Volume II, Current Edition.

[B8] MIL-HDBK-237, Department of Defense, Military Handbook: Electromagnetic Environmental Effects and Spectrum Supportability Guidance for the Acquisition Process, Current Edition.

[B9] MIL-STD-188-124, Department of Defense, Military Standard: Grounding, Bonding and Shielding for Common Long Haul/Tactical Communication Systems Including Ground Based Communications Electronics Facilities and Equipments, Current Edition.

[B10] MIL-STD-461, Department of Defense, Interface Standard: Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment, Current Edition.

[B11] MIL-STD-464, Department of Defense, Interface Standard: Electromagnetic Environmental Effects Requirements for Systems, Current Edition.

[B12] MIL-STD-889, Department of Defense, Military Standard: Dissimilar Metals, Current Edition.

[B13] MIL-STD-962, Department of Defense, Standard Practice: Format and Content, Current Edition.

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Plans

OXR Bid Plan Set

See Separate Document