SPECIFICATIONS

AMERICAN AVENUE DISPOSAL SITE PHASE III – MODULES 9 & 10 EXCAVATION AND LINER CONSTRUCTION

18950 W AMERICAN AVE, KERMAN, CA 93630

BUDGET / ACCOUNT: 9026 / 8150

Department of Public Works and Planning

CONTRACT NUMBER 23-24-SW

T A B L E O F C O N T E N T S

COUNTY ADOPTION AND ACKNOWLEDGEMENT

PROJECT: AMERICAN AVENUE DISPOSAL SITE PHASE III – MODULES 9 & 10 EXCAVATION AND LINER CONSTRUCTION

CONTRACT NUMBER: 23-24-SW

Nathan Magsig, Chairman	5th District
Ernest Buddy Mendes, Vice Chairman	4th District
Brian Pacheco	1st District
Steve Brandau	2nd District
Sal Quintero	3rd District

Paul Nerland, County Administrative Officer

Steven E. White, Director
Department of Public Works and Planning

_____

REGISTERED PROFESSIONAL ENGINEER
SEBASTIAN T. ARTAL
No. C76724
Exp.12/31/24
CIVIL
STATE OF CALIFORNIA

Date Signed: 1/9/2024

Supervising Engineer: _____
Sebastian Artal, PE 76724

FRESNO COUNTY
Department of Public Works and Planning
m/a 2220 Tulare Street, Suite 720
Fresno, CA 93721-2106

COUNTY ADOPTION AND ACKNOWLEDGEMENT

PROJECT: AMERICAN AVENUE DISPOSAL SITE PHASE III – MODULES 9 & 10 EXCAVATION AND LINER CONSTRUCTION

CONTRACT NUMBER: 23-24-SW

Date Signed: January 9, 2024

Consultant Engineer: _____

Jacob Russell, PE C64512

Geologic and Associates
4190 Douglas Blvd., Suite 250
Granite Bay, CA 95746

COUNTY OF FRESNO **STATE OF CALIFORNIA**

NOTICE TO BIDDERS

Sealed proposals will be received at:

https://www.bidexpress.com/businesses/36473/home

and at the Fresno County Department of Public Works and Planning (Department), Office of the Design Engineer, Seventh Floor, Fresno County Plaza Building, 2220 Tulare Street, Fresno, CA 93721 until

2:00 P.M., (1400 hours and 00 seconds)
Thursday, February 8, 2024

If you have any questions about bid submission, please contact us at DesignServices@fresnocountyca.gov or calling (559) 353-4919 or (559) 600-4543.

Promptly following the closing of the bidding all timely submitted bids will be publicly opened and viewable via a livestream (the link for which will be posted at http://www.fresnocountyca.gov/planholders) for construction in accordance with the project specifications therefor, to which special reference is made as follows:

AMERICAN AVENUE DISPOSAL SITE PHASE III – MODULES 9 & 10 EXCAVATION AND LINER CONSTRUCTION

18950 W AMERICAN AVE, KERMAN, CA 93630

CONTRACT NUMBER 23-24-SW

The work to be done consists, in general, of the excavation of Modules 9 & 10, installation of a composite liner system consisting of geosynthestics over a geosynthetic clay liner, and the performance of a geoelectric leak detection survey support. It also includes, but is not limited to, the installation of Modules 9 & 10 sump liner system, riser pipes, pumps and control panels, clean out pipes, leachate and lysimeter meter runs and all miscellaneous work associated with the installation of these items, construction of Landfill customer access roads and side ditches as well as installation of erosion control items. Clearing and grubbing is to be performed and the project site is to be finished. Other items or details not mentioned herein that are required by the plans, Standard Specifications or these special provisions shall be performed, constructed, furnished or installed.

A pre-bid conference will be held at 1:30 p.m., on Tuesday, January 23, 2024.

A discussion of the project will be held and the project sites will be open for examination. Contractors should meet at 18950 W AMERICAN AVE, KERMAN, CA 93630. **Attendance at the pre-bid is mandatory. Any bidder who fails to be present will be deemed nonresponsive.** The scheduled pre-bid will be the only opportunity for prospective bidders to visit the site in the presence of County staff, and requests for individual site visits with County staff will not be granted.

The following items shall be used for this project and no substitution shall be allowed[1]:

- MOXA AWK-3121 US-T Ethernet Wi-Fi radio modem (for high temperature range)
- WSDPT 3-5 surePump

[1] The public interest finding is subject to approval by the Fresno County Board of Supervisors on February 6, 2024.

- Promag P 300 5P3B25-4RD5/0
- Kayo 9 slot programmable logic controller (PLC), AutomationDirect D2-262 CPU, with H2-ECOM-100 Ethernet interface module and EA7-T6CL HMI display

This project is subject to the contracting requirements and implementing regulations as amended in Title 13, Section 2449 General Requirements for In-Use Off-Road Diesel-Fueled Fleets, of the California Code of Regulations (13 CCR § 2449(i)). Bidders and their listed subcontractors must submit valid Certificates of Reported Compliance (CRCs) issued by the California Air Resources Control Board and any supporting documentation within five (5) calendar days of bid opening. Failure to submit the required CRCs may render a bid non-responsive.

Bidders may fill out a Request to be Added to Planholders list:

https://www.fresnocountyca.gov/Departments/Public-Works-and-Planning/Construction-Bidding-Opportunities/Request-to-Be-Added-to-the-Planholders-List-Form

Requesters will then be listed as a planholder for the project on the website and receive notifications and addenda issued for the project.

Prospective bidders may also select the project on www.BidExpress.com. Those that demonstrate interest in the project will be added to the planholders list, and receive notifications and addenda issued for the project.

Planholder and exchange/publication names may be obtained from the Fresno County website at http://www.fresnocountyca.gov/planholders.

Electronic copies, in ".pdf" file format, of the official project plans and specifications, bid books and proposal sheets, and such additional supplemental project information as may be provided, are available to view, download, and print at http://www.fresnocountyca.gov/planholders.

If a bidder is unable to submit a bid via Bid Express, Bid Books, which contain bid proposal sheets necessary to submit a bid, may be obtained within the Specifications documents posted on the Fresno County website.

Electronic bids shall be submitted via the BidExpress website. Hardcopy bids shall be submitted in a sealed envelope addressed to the Department and labeled with the name of the bidder, the name of the project and the statement "Do Not Open Until The Time Of Bid Opening."

Bid security in the amount of ten (10) percent of the amount of the bid, and in the form of a bid bond issued by an admitted surety insurer licensed by the California Department of Insurance, cash, cashier's check or certified check shall accompany the bid. You must either attach an electronic bid bond or provide an original bid bond (or other form of bid security authorized by Public Contract Code Section 20129(a)), prior to the bid opening. Bid security shall be made in favor of the County of Fresno.

Hardcopy bid bonds shall be submitted in a sealed envelope addressed to the Department and labeled with the name of the bidder, the name of the project and the statement "Do Not Open Until The Time Of Bid Opening – BID BOND".

A Summary of Bids and a list of subcontractors for the apparent low bidder will be posted at the above listed website, generally within 24 hours of the Bid Opening.

All questions regarding this project shall be in writing and shall be received by the Department of Public Works and Planning, Design Division, no later than 2:00 P.M. on the seventh (7th) calendar day before bid opening. Any questions received after this deadline will not receive a response unless the Department of Public Works and Planning elects to issue an addendum to revise the bid opening date. In the event that the bid opening date is revised, the deadline for questions will be extended to no later than 2:00 P.M. on the seventh (7th) calendar day before the revised bid opening date. Questions shall be submitted on the "Request for Clarification Form" provided on our website:

http://www.fresnocountyca.gov/Departments/Public-Works-and-Planning/Construction-Bidding-Opportunities/23-24-SW-American-Avenue-Disposal-Site-Phase-III-Modules-9-and-10/Request-for-Clarification-Form

Any changes to, or clarification of, the project plans and specifications shall be in the form of a written addendum issued to planholders of record. Questions that prompt a change or clarification shall be included in the addendum with the subsequent answer.

Any oral explanation or interpretations given to this project are not binding.

No contract will be awarded to a contractor who has not been licensed in accordance with the provisions of the Contractors State License Law, California Business and Professions Code, Division 3, Chapter 9, as amended, or whose bid is not on the proposal form included in the contract document. A valid California Contractor's License, **Class A (General Engineering)**, is required for this project.

Pursuant to Section 1773 of the Labor Code, the general prevailing wage rates in the county, or counties, in which the work is to be done have been determined by the Director of the California Department of Industrial Relations. These wages are set forth in the General Prevailing Wage Rates for this project, available at County of Fresno, Department of Public Works and Planning, 2220 Tulare Street, Sixth Floor, Fresno CA 93721-2104 and available from the California Department of Industrial Relations' Internet web site at http://www.dir.ca.gov/DLSR/PWD. Future effective general prevailing wage rates, which have been predetermined and are on file with the California Department of Industrial Relations are referenced but not printed in the general prevailing wage rates.

This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

No contractor or subcontractor may be listed on a bid proposal for a public works project 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 unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

This contract is subject to state contract nondiscrimination and compliance requirements pursuant to Government Code, Section 12990.

Bids are required for the entire work described herein. Bids will be compared on the basis of the cumulative sum of the bid amounts listed for the individual line items.

The successful bidder shall furnish a faithful performance bond in the amount of 100 percent of the contract amount and a payment bond in the amount of 100 percent of the contract amount. Each bond specified in this Notice (bid bond, faithful performance bond and payment bond) shall meet

the requirements of all applicable statutes, including but not limited to those specified in Public Contract Code section 20129 and Civil Code section 3248.

Each bond specified in this Notice shall be issued by a surety company designated as an admitted surety insurer in good standing with and authorized to transact business in this state by the California Department of Insurance, and acceptable to the County of Fresno. Bidders are cautioned that representations made by surety companies will be verified with the California Department of Insurance. Additionally, the County of Fresno, in its discretion, when determining the sufficiency of a proposed surety company, may require the surety company to provide additional information supported by documentation. The County generally requires such information and documentation whenever the proposed surety company has either a Best's Key Rating Guide of less than **A** and a financial size designation of less than **VIII**. Provided, however, that the County expressly reserves its right to require all information and documentation to which the County is legally entitled from any proposed surety company.

The Board of Supervisors reserves the right to reject any or all bids.

Board of Supervisors, County of Fresno

Paul Nerland, County Administrative Officer

Bernice E. Seidel, Clerk of the Board

Issue Date: January 9, 2024

Special Provisions

DIVISION I GENERAL PROVISIONS

1 GENERAL

1-1.01 GENERAL

Add to the beginning of Section 1:

The work is done in accordance with the 2015 *Standard Specifications*, 2015 *Standard Plans* and the following special provisions.

Where these special provisions indicate to replace, add to, delete, delete from, or otherwise modify a "section," or a portion thereof, the section or portion thereof to which such modification is to be applied is the section or portion thereof with the corresponding numbering in the 2015 *Standard Specifications*.

Except to the extent that they may conflict with these special provisions, revised standard specifications apply if included in the project details section of the book entitled "Specifications."

Revised standard plans apply if listed on the "List of Revised Standard Plans," if any, in these special provisions; or if shown or referenced on the project plans or in the project details section of the book entitled "Specifications."

In case of conflict between the *Standard Specifications* and these special provisions, the special provisions shall take precedence over and be used in lieu of such conflicting portions.

In case of conflict between applicable revised standard specifications and these special provisions, the special provisions shall take precedence over and be used in lieu of such conflicting portions.

Add to the end of section 1-1.01:

Refer to Section 9 for Explanation of Bid items

Add to the 1st table of section 1-1.06:

SJVAPCD	San Joaquin Valley air pollution control district
AQMD	air quality management district
CISS	cast-in-steel shell
CSL	crosshole sonic logging
GGL	gamma-gamma logging
METS	Caltrans Material Engineering and Testing Services

Add to section 1-1.06:

Abbreviations in the Bid Items and Applicable Sections are also used in the Bid Item List - Proposal 2.

Replace Section 1-1.07 with:

1-1.07 DEFINITIONS

1-1.07A General

Interpret terms as defined in the Contract documents.

1-1.07B Glossary

abandon: Render unserviceable in place.

acts of God: *Acts of God* as defined in Pub Cont Code § 7105.

activity: Task, event, or other project element on a schedule that contributes to completing the project. An activity has a description, start date, finish date, duration, and one or more logic ties.

adjust: Raise or lower a facility to match a new grade line.

aerially deposited lead: Lead primarily from vehicle emissions deposited within unpaved areas or formerly unpaved areas.

Authorized Facility Audit List: Caltrans-developed list of facilities. For the Authorized Facility Audit List, go the METS website.

authorized laboratory: Independent testing laboratory (1) not employed or compensated by any subcontractor or subcontractor's affiliate providing other services for the Contract and (2) authorized by the Department.

Authorized Material List: Caltrans-developed list of authorized materials. For the Authorized Material List go to the METS website.

Authorized Material Source List: Caltrans-developed list of authorized source materials. For the Authorized Material Source List go to the METS website.

base: Layer of specified material of planned thickness placed immediately below the pavement or surfacing.

basement material: Material in an excavation or embankment under the lowest layer to be placed.

bid item: Work unit for which the Bidder provides a price.

Bid Item List: List of bid items, units of measure, and the associated quantities. The verified Bid Item List is the Bid Item List with verified prices. The Contract Proposal (Proposal 2) of Low Bidder at the Department's website is the verified Bid Item List. After contract award, interpret a reference to the Bid Item List as a reference to the verified Bid Item List.

borrow: Fill acquired from an excavation source outside the described cut area.

1. **local borrow:** Material obtained by widening cuts or excavating from sources outside the planned or authorized cross section on the job site. The location of the local borrow is described or designated by the Engineer.
2. **imported borrow:** Borrow that is not local borrow.

bridge: Structure that:

1. Has a bridge number
2. Carries a (1) utility, (2) railroad, or (3) vehicle, pedestrian, or other traffic over, under, or around obstructions or waterways

building-construction contract: Contract that has *Building Construction* on the cover of the *Notice to Bidders and Special Provisions*.

California Test: Caltrans-developed test for determining work quality. For California Tests, go to the METS website.

Caltrans: State of California Department of Transportation

certificate of compliance: Certificate stating the material complies with the Contract.

Certified Industrial Hygienist: Industrial hygienist certified in comprehensive practice by the American Board of Industrial Hygiene.

change order work: Work described in a Change Order, including extra work and work described in the Contract as change order work.

closure: Closure of a traffic lane or lanes, including shoulder, ramp, or connector lanes, within a single traffic control system.

commercial quality: Quality meeting the best general practices.

commercial source: Established business operating as a material source for the general public.

Contract: Written and executed contract between the Department and the Contractor.

Contract acceptance: Director's written acceptance of a completed Contract.

Contract time: Number of original working days as adjusted by any time adjustment.

Contractor: Person or business or its legal representative entering into a Contract with the Department for performance of the work.

controlling activity: Construction activity that will extend the scheduled completion date if delayed.

County: The County of Fresno

critical path: Longest continuous chain of activities for the project that has the least amount of total float of all chains. In general, a delay on the critical path extends the scheduled completion date.

critical path method: Network-based planning technique using activity durations and relationships between activities to calculate a schedule for the entire project.

culvert: Structure other than a bridge that provides an opening under a roadway.

data date: Day after the date through which a schedule is current. Everything occurring earlier than the data date is as-built and everything on or after the data date is planned.

day: 24 consecutive hours running from midnight to midnight; calendar day.

1. **business day:** Day on the calendar except a Saturday and a holiday.
2. **working day:** Time measure unit for work progress. A working day is any 24-consecutive-hour period except:
    2.1. Saturday and a holiday.
    2.2. Day during which you cannot perform work on the controlling activity for at least 50 percent of the scheduled work shift with at least 50 percent of the scheduled labor and equipment due to any of the following:
        2.2.1. Adverse weather-related conditions.
        2.2.2. Traffic maintenance under the Contract.
        2.2.3. Suspension of a controlling activity that you and the Engineer agree benefits both parties.
        2.2.4. Unanticipated event not caused by either party, such as:
            2.2.4.1. Act of God
            2.2.4.2. Act of a public enemy.
            2.2.4.3. Epidemic.
            2.2.4.4. Fire.
            2.2.4.5. Flood.
            2.2.4.6. Governor-declared state of emergency.
            2.2.4.7. Landslide.
            2.2.4.8. Quarantine restriction.
        2.2.5. Issue involving a third party, including:
            2.2.5.1. Industry or area-wide labor strike.
            2.2.5.2. Material shortage.
            2.2.5.3. Freight embargo.
            2.2.5.4. Jurisdictional requirement of a law enforcement agency.
            2.2.5.5. Workforce labor dispute of a utility or nonhighway facility owner resulting in a nonhighway facility rearrangement not described and not solely for the Contractor's convenience. Rearrangement of a nonhighway facility includes installation, relocation, alteration, or removal of the facility.
    2.3. Day during a concurrent delay.
3. **original working days:**
    3.1. Working days to complete the work shown on the *Notice to Bidders* for a non-cost-plus-time-based bid
    3.2. Working days bid to complete the work for a cost-plus-time-based bid

    Where working days is specified without the modifier *original* in the context of the number of working days to complete the work, interpret the number as the number of original working days as adjusted by any time adjustment.

deduction: Money permanently taken from a progress payment or the final payment. Deductions are cumulative and are not retentions under Pub Cont Code § 7107.

delay: Event that extends the completion of an activity.

1. **excusable delay:** Delay caused by the Department and not reasonably foreseeable when the work began, such as:
    1.1. Change in the work
    1.2. Department action that is not part of the Contract

1.3. Presence of an underground utility main not described in the Contract or in a location substantially different from that specified
1.4. Described facility rearrangement not rearranged as described, by the utility owner by the date specified, unless the rearrangement is solely for the Contractor's convenience
1.5. Department's failure to obtain timely access to the right-of-way
1.6. Department's failure to review a submittal or provide notification in the time specified

2. **critical delay:** Excusable delay that extends the scheduled completion date
3. **concurrent delay:** Occurrence of at least 2 of the following events in the same period of time, either partially or entirely:
   3.1. Critical delay
   3.2. Delay to a controlling activity caused by you
   3.3. Non–working day

Department: The Fresno County Board of Supervisors and its authorized representatives.

District Office: County of Fresno Department of Public Works and Planning

detour: Temporary route for traffic around a closed road part. A passageway through a job site is not a detour.

Director: Department's Chairman

disadvantaged business enterprise: Disadvantaged business enterprise as defined in 49 CFR 26.5.

dispose of: Remove from the job site.

divided highway: Highway with separated traveled ways for traffic, generally in opposite directions.

Engineer: The County's Director of Public Works and Planning, acting through their authorized designees.

early completion time: Difference in time between an early scheduled completion date and the work completion date.

environmentally sensitive area: Area within or near construction limits where access is prohibited or limited to protect environmental resources.

estimated cost: Estimated cost of the project as shown on the *Notice to Bidders*.

extra work: Any work, desired or performed, but not included in the original Contract.

federal-aid contract: Contract that has a federal-aid project number on the cover of the *Specifications*.

final pay item: Bid item whose quantity shown on the Bid Item List is the quantity paid.

finished grade: Final surface of the completed facility. If the work under the Contract includes stage construction, the relation between the finished grade and the work under the Contract is shown.

fixed cost: Labor, material, or equipment cost directly incurred by the Contractor as a result of performing or supplying a particular bid item that remains constant regardless of the item's quantity.

float: Difference between the earliest and latest allowable start or finish times for an activity.

1. **Department-owned float:** Time saved on the critical path by actions of the Department. It is the last activity shown on the schedule before the scheduled completion date.

force account work: Work ordered on a construction project without an existing agreement on its cost, and performed with the understanding that the contractor will bill the owner according to the cost of labor, materials, and equipment, plus a certain percentage for overhead and profit.

grading plane: Basement material surface on which the lowest layer of subbase, base, pavement, surfacing, or other specified layer is placed.

highway: Whole right-of-way or area reserved for use in constructing the roadway and its appurtenances.

holiday: Holiday shown in the following table:

Holidays

Holiday	Date observed
Every Sunday	Every Sunday
New Year's Day	January 1st
Birthday of Martin Luther King, Jr.	3rd Monday in January
Presidents' Day	3rd Monday in February
Cesar Chavez Day	March 31st
Memorial Day	Last Monday in May
Independence Day	July 4th
Labor Day	1st Monday in September
Veterans Day	November 11th
Thanksgiving Day	4th Thursday in November
Day after Thanksgiving Day	Day after Thanksgiving Day
Christmas Day	December 25th

If January 1st, March 31st, July 4th, November 11th, or December 25th fall on a Sunday, the Monday following is a holiday. If January 1st, March 31st, July 4th, November 11th, or December 25th fall on a Saturday, the preceding Friday is a holiday.

hours of darkness: Hours of darkness as defined in Veh Code § 280.

idle equipment: Equipment:

1. On the job site at the start of a delay
2. Idled because of the delay
3. Not operated during the delay

informal-bid contract: Contract that has *Informal Bid Authorized by Pub Cont Code § 10122* on the cover of the *Notice to Bidders and Special Provisions*.

job site: Area within the defined boundaries of a project.

Labor Surcharge and Equipment Rental Rates: Caltrans publication that lists labor surcharge and equipment rental rates.

landscaping: Practice of a landscaping contractor under 16 CA Code of Regs § 832.27.

material: Any product or substance specified for use in the construction of a project.

material shortage:

1. Shortage of raw or produced material that is area-wide and caused by an unusual market condition except if any of the following occurs:
   1.1. Shortage relates to a produced, nonstandard material
   1.2. Supplier's and the Contractor's priority for filling an order differs
   1.3. Event outside the United States for a material produced outside the United States
2. Unavailability of water that delays a controlling activity

material source facility audit: Self-audit and a Caltrans audit evaluating a facility's capability to consistently produce materials that comply with Caltrans standards.

median: Portion of a divided highway separating the traveled ways including inside shoulders.

milestone: Event activity that has zero duration and is typically used to represent the start or end of a certain stage of the project.

mobilization: Preparatory work that must be performed or costs incurred before starting work on the various items on the job site (Pub Cont Code § 10104).

modify: Add to or subtract from an appurtenant part.

narrative report: Document submitted with each schedule that discusses topics related to project progress and scheduling.

near critical path: Chain of activities with total float exceeding that of the critical path but having not more than 10 working days of total float.

obliterate: Place an earth cover over or root, plow, pulverize, or scarify.

Office engineer: The Director of Public Works and Planning for the County of Fresno

pavement: Uppermost layer of material placed on a traveled way or shoulder.

plans: Standard plans, revised standard plans, and project plans.

1. **standard plans:** Drawings standard to Department construction projects. These plans are in a book titled *Standard Plans*.
2. **revised standard plans:** New or revised standard plans. These plans are listed in the *List of Revised Standard Plans* in a book titled *Specifications*.
3. **project plans:** Drawings specific to the project, including authorized shop drawings. These plans also include a section titled *Project Details* of a book titled *Specifications*.

plant establishment period: Number of days shown on the *Notice to Bidders* for plant establishment.

quality characteristic: Characteristic of a material that is measured to determine conformance with a given requirement.

quality control plan: Contractor's plan to ensure QC.

reconstruct: Remove and disassemble and construct again at an existing or new location.

relocate: Remove and install or place in a new location.

remove: Remove and dispose of.

reset: Remove and install or place laterally at the same station location.

roadbed: Roadway portion extending from the curb line to curb line or the shoulder line to shoulder line. A divided highway has 2 roadbeds.

roadside: Area between the outside shoulder edge and the right-of-way limits.

roadway: Portion of the highway within the outside lines of curbs, sidewalks, slopes, ditches, channels, or waterways. A roadway includes the structures and features necessary for safety, protection of facilities, and drainage.

salvage: Remove, clean, and haul to a specified location.

schedule:

1. **baseline schedule:** Initial schedule showing the original work plan starting on the date of Contract approval. This schedule shows no completed work to date and no negative float or negative lag to any activity.
2. **revised schedule:** Schedule that incorporates a proposed or past change to logic or activity durations.
3. **updated schedule:** Current schedule developed from the accepted baseline and any subsequent accepted updated or revised schedules through regular monthly review to incorporate actual past progress.

scheduled completion date: Planned work completion date shown on the current schedule.

shoulder: Roadway portion contiguous with the traveled way for accommodation of a stopped vehicle, emergency use, and lateral support of base and surface courses.

small tool: Tool or piece of equipment not listed in Labor Surcharge and Equipment Rental Rates that has a replacement value of $500 or less.

specifications: Standard specifications, revised standard specifications, and special provisions.

1. **standard specifications:** Specifications standard to Department construction projects. These specifications are in a book titled *Standard Specifications*.

2. **revised standard specifications:** New or revised standard specifications. These specifications are in a section titled *Revised Standard Specifications* of a book titled *Specifications*.
3. **special provisions:** Specifications specific to the project. These specifications are in a section titled *Special Provisions* of a book titled *Specifications*.

State: State of California, including its agencies, departments or divisions whose conduct or action is related to the work.

Structure Design: Offices of Structure Design of the Department of Transportation.

subbase: Layer of material between a base and the basement material.

subgrade: Roadbed portion on which pavement, surfacing, base, subbase, or a layer of any other material is placed.

submittal:

1. **action submittal:** Written and graphic information and samples that require the Department's response.
2. **informational submittal:** Written information that does not require the Department's response.

substantial defects: Defects plainly seen as damaged, displaced, or missing parts or improper functioning of materials, parts, equipment, or systems.

substructure: Bridge parts below the bridge seats, pier tops, and haunches for rigid-framed bridges or spring lines for arched bridges; includes abutment backwalls, abutment parapets, and wingwalls.

superstructure: Bridge parts except the substructure.

supplemental project information: Information relevant to the project, specified as supplemental project information, and made available to bidders.

surfacing: Uppermost layer of material placed on a traveled way or shoulders; pavement.

time impact analysis: Analysis using a CPM schedule developed specifically to demonstrate the effect a proposed or past change or delay has on the current scheduled completion date.

time-scaled network diagram: Graphic depiction of a CPM schedule comprised of activity bars with relationships for each activity represented by arrows. The tail of each arrow connects to the activity bar for the predecessor and points to the successor.

total bid: Sum of the item totals as verified by the Department; original Contract price.

total float: Amount of time that an activity or chain of activities can be delayed before extending the scheduled completion date.

traffic: Pedestrians, bicyclists, ridden or herded animals, vehicles, streetcars, and other conveyances either singularly or together while using any highway for purposes of travel.

traffic lane: Portion of traveled way used for the movement of a single line of vehicles.

traveled way: Portion of the roadway for the movement of vehicles, exclusive of the shoulders, berms, sidewalks, and parking lanes.

tunnel: Tunnel as defined in 8 CA Code of Regs § 8405 et seq.

unauthorized work: Work performed beyond the lines and grades described in the Contract or established by the Engineer or extra work performed without Department authorization.

unsuitable material: Material encountered below the natural ground surface in embankment areas or below the grading plane in excavation areas that the Engineer determines to be in any of the following conditions:

1. Of such unstable nature that it cannot be compacted to the specified density using ordinary methods at optimum moisture content.
2. Too wet to be properly compacted and cannot be dried before incorporating it into the work. Excessive moisture alone is not sufficient cause for determining that the material is unsuitable.

3. Inappropriate for the planned use.

withhold: Money temporarily or permanently taken from a progress payment.

work: Resources and activities required for Contract acceptance, including labor, materials, equipment, and the created product.

work plan: Detailed formulation of a program of action.

work zone: Area of a highway with construction, maintenance, or utility work activities.

1-1.08 DISTRICTS

Replace Section 1.08 with:

Not Used

Add to the end of Section 1-1.09

This project is not in a freeze-thaw area.

Replace Section 1-1.10 with:

1-1.10 PAVEMENT CLIMATE REGIONS

To help account for the effects of various climatic conditions on pavement performance, the State has been divided into 9 climate regions. The project's pavement climate region is inland valley.

Replace Section 1-1.11 with:

1-1.11 WEBSITES, ADDRESSES, AND TELEPHONE NUMBERS

Websites, Addresses, and Telephone Numbers

Reference or agency or department unit	Website	Address	Telephone no.
Authorized Material Lists Authorized Material Source Lists	https://dot.ca.gov/programs/engineering-services/authorized-materials-lists	--	--
CA Unified Certification Program's list of certified DBEs	https://dot.ca.gov/programs/civil-rights/dbe-search	--	--
California MUTCD	https://dot.ca.gov/programs/safety-programs/camutcd	--	--
Data Interchange for Materials Engineering	https://dime.dot.ca.gov/	Materials Engineering and Testing Services Department of Transportation 5900 Folsom Blvd Sacramento CA 95819-4612	(916) 227- 5238
Department	https://www.fresnocountyca.gov/Departments/Public-Works-and-Planning	2220 Tulare Street Design Division – Seventh Floor Fresno, CA 93721	(559) 600-9908
Department of Conservation, Office of Mine Reclamation	http://www.conservation.ca.gov/dmr/	--	--
Department of General Services, Office of Small Business and DVBE Services	https://www.dgs.ca.gov/OBAS	Office of Small Business and DVBE Services Department of General Services 707 3rd St West Sacramento CA 95605- 2811	(800) 559- 5529 (916) 375- 4940
Department of Industrial Relations	http://www.dir.ca.gov	455 Golden Gate Ave San Francisco CA 94102	--
Design Services - Contract Administration, Planholders, Bid Results	https://www.fresnocountyca.gov/Departments/Public-Works-and-Planning/Construction-Bidding-Opportunities	2220 Tulare Street Design Division – Seventh Floor Fresno, CA 93721	Tel: (559) 353-4919 Fax:(559) 455-4609 Email: DesignServices@fresnocountyca.gov
Division of Accounting, Office of External Accounts Payable	https://dot.ca.gov/programs/accounting	Major Construction Payment and Information Unit Office of External Accounts Payable Division of Accounting Department of Transportation P.O. Box 168043 Sacramento, CA 95816-8043	(916) 227-9013
Division of Construction	http://www.dot.ca.gov/hq/construc/	--	--
Geotechnical Services	https://dot.ca.gov/programs/engineering-services	Geotechnical Services Department of Transportation 5900 Folsom Blvd Sacramento, CA 95819-4612	(916) 227-7000

METS	https://dot.ca.gov/programs/engineering-services	Materials Engineering and Testing Services Department of Transportation 5900 Folsom Blvd Sacramento, CA 95819-4612	(916) 227-7000
MPQP	https://dot.ca.gov/programs/construction/material-plant-quality-program	--	--
Engineer	--	Director of Public Works & Planning Fresno County 2220 Tulare St, 8th Floor Fresno, CA 93721	(559) 600-4078
Offices of Structure Design, Documents Unit	--	MSC 9-4/4I Documents Unit Offices of Structure Design Department of Transportation 1801 30th St Sacramento, CA 95816-7006	(916) 227-0716
Publication Distribution Unit	--	Publication Unit Department of Transportation 1900 Royal Oaks Dr Sacramento, CA 95815-3800	--

Replace Section 1-1.12 with:

1-1.12 MISCELLANY

Make checks and bonds payable to the County of Fresno.

Replace Section 2 with:

2 BIDDING

2-1.01 GENERAL

Section 2 includes specifications related to bid eligibility and the bidding process.

2-1.02 BID INELIGIBILITY

A firm that has provided architectural or engineering services to the Department for this contract before bid submittal for this contract is prohibited from any of the following:

1. Submitting a bid
2. Subcontracting for a part of the work
3. Supplying materials

2-1.03 CONTRACTOR REGISTRATION

No contractor or subcontractor may be listed on a bid proposal for a public works project 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)].

2-1.04–2-1.05 RESERVED

2-1.06 BID DOCUMENTS

2-1.06A General

The *Bid* book includes bid forms and certifications and may be requested from Design Services and are available online at http://www.BidExpress.com.

The *Specifications* includes the *Notice to Bidders*, revised standard specifications, project details, and special provisions.

The *Specifications*, project plans, and any addenda to these documents may be accessed at Design Services.

The *Standard Specifications* and *Standard Plans* may be purchased at the Publication Distribution Unit or accessed online at https://www.fresnocountyca.gov/files/sharedassets/county/vision-files/files/58025-2015-standard-specifications.pdf.

2-1.06B Supplemental Project Information

The Department makes the following supplemental project information available:

Supplemental Project Information

Where Available	Description
Included in Project Details	• Construction Quality assurance plan • Title V Permit to Operate in San Joaquin Air Pollution Districts Limits • SJVAPCD Rule 9510 determination letter
Available on Design Services webpage	• Cross Sections

If as-built drawings are available they may not show existing dimensions and conditions. Where new construction dimensions are dependent on existing bridge dimensions, verify the field dimensions and adjust the dimensions of the work to fit the existing conditions.

2-1.06C–2-1.06D Reserved

2-1.07 JOB SITE AND DOCUMENT EXAMINATION

Examine the job site and bid documents. Notify the Department of apparent errors and patent ambiguities in the plans, specifications, and Bid Item List. Failure to do so may result in rejection of a bid or rescission of an award.

Bid submission is your acknowledgment that you have examined the job site and bid documents and are satisfied with:

1. General and local conditions to be encountered
2. Character, quality, and scope of work to be performed
3. Quantities of materials to be furnished
4. Character, quality, and quantity of surface and subsurface materials or obstacles
5. Requirements of the contract

2-1.08 RESERVED

2-1.09 BID ITEM LIST

Submit a bid based on the bid item quantities the Department shows on Bid Item List.

2-1.10 SUBCONTRACTOR LIST

On the Subcontractor List form, list each subcontractor to perform work in an amount in excess of 1/2 of 1 percent of the total bid or $10,000, whichever is greater (Pub Cont Code § 4100 et seq.).

For each subcontractor listed, the Subcontractor List form must show:

1. Business name and the location of its place of business.
2. California contractor license number for a non-federal-aid contract.
3. Public works contractor registration number.
4. Portion of work it will perform. Show the portion of the work by:
   - 4.1. Bid item numbers for the subcontracted work
   - 4.2. Percentage of the subcontracted work for each bid item listed
   - 4.3. Description of the subcontracted work if the percentage of the bid item listed is less than 100 percent

2-1.13–2-1.30 RESERVED

Replace section 2-1.31 with:

2-1.31 RESERVED

2-1.31 OPT OUT OF PAYMENT ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS

Not Used

2-1.32 RESERVED

2-1.33 BID DOCUMENT COMPLETION AND SUBMITTAL

2-1.33A General

Complete forms in the *Bid* book.

Submit an electronic bid online at http://www.BidExpress.com (Section 2-1.33D) or submit a hardcopy bid:

1. Under sealed cover
2. Marked as a bid
3. Identifying the contract number and the bid opening date

Certain bid forms must be submitted with the bid and properly executed.

Certain other forms and information must be submitted either with the bid or within the prescribed period after bid opening as specified elsewhere in these special provisions.

Failure to submit the forms and information as specified results in a nonresponsive bid.

If an agent other than the authorized corporation officer or a partnership member signs the bid, file a Power of Attorney with the Department either before opening bids or with the bid. Otherwise, the bid may be nonresponsive.

2-1.33B Bid Item List and Bid Comparison

Submit a bid based on the bid item quantities the Department shows on Proposal 2. Bids will be evaluated and the low bidder determined as indicated in the *Notice to Bidders.*

Do not submit an unbalanced bid. An unbalanced is a bid is one in which one or more bid items is/are considered by the Department to have been bid at an amount that is unreasonably high or unreasonably low. A bid may be considered to be non-responsive and may be rejected if it is considered by the Department to be unbalanced.

2-1.33C Bid Document Completion

Proposal items are identified by title and by the word “Proposal” followed by the number assigned to the proposal item in question. Proposal items are included in the *Bid Book.*

2-1.33C(1) Proposal 1 - Proposal to the Board of Supervisors of Fresno County

2-1.33C(2) Proposal 2 - Bid Item List

One or more sheet(s) or list(s) upon which the bidder completes the bid.

Fill out completely including a unit price and total for each unit price-based item and a total for each lump sum item.

Do not make any additions such as “plus tax”, “plus freight”, or conditions such as “less 2% if paid by 15th”.

Use ink or typewriter for paper bids.

2-1.33C(3) Proposal 3 - Evaluation of Bid Item List

Describes how inconsistences and irregularities are evaluated and corrected when Design Services reviews the Bid Item List.

2-1.33C(4) Proposal 4 - Bid Security and Signature

Submit one of the following forms of bidder's security equal to at least 10 percent of the bid:

- Cash
- Cashier's check
- Certified check
- Signed bidder's bond by an admitted surety insurer

Indicate type of bid security provided.

- Cash – Acceptable but not recommended. Cash is deposited in a clearing account and is returned to bidders by County warrant. This process may take several weeks.
- Cashier's or Certified Checks. This type of security is held until the bid is no longer under consideration. If submitted by a potential awardee, they will be returned when the contract is fully executed by the bidder and bonds and insurance have been approved.
- Bid Bonds - Must be signed by the bidder and by the attorney-in-fact for the bonding company. Provide notarized signature of attorney-in-fact accompanied by bonding company's affidavit authorizing attorney-in-fact to execute bonds. An unsigned bid bond will be cause for rejection.

Bonding companies may provide their own bid bond forms. Proposal 4 must be completed by the bidder and submitted with their bid.

Provide contractor's license information.

State business name and if business is a:

- Corporation - list officers
- Partnership - list partners
- Joint Venture - list members; if members are corporations or partnerships, list their officers or partners.
- Individual - list Owner's name and firm name style

Signature of Bidder - the following lists types of companies and corresponding authorized signers.

- Corporation - by an officer
- Partnership - by a partner
- Joint Venture - by a member
- Individual - by the Owner

If signature is by a Branch Manager, Estimator, Agent, etc., the bid must be accompanied by a power of attorney authorizing the individual to sign the bid in question or to sign bids more generally, otherwise the bid may be rejected.

Business Address - Firm's Street Address

Mailing Address - P.O. Box or Street Address

Complete, sign, and return with bid.

2-1.33C(5) Proposal 5 - Noncollusion Declaration

Must be completed, signed, and returned with bid.

2-1.33C(6) Proposal 6 - Public Contract Code Section 10285.1 Statement

Select "has" or "has not" in accordance with instructions on form, return with completed for with bid. Note that signing the bid constitutes signing this statement.

2-1.33C(7) Proposal 7 - Public Contract Code Section 10162 Questionnaire And Public Contract Code 10232 Statement

Select: "yes" or "no" accordance with instructions on form, include explanation if "yes" is selected. Return completed form with bid. Note that signing the bid constitutes signing this questionnaire and statement.

2-1.33C(8) Proposal 8(a) through Proposal 8(f) - Subcontractors

Sheet(s) or spaces where bidders list subcontractors. List each subcontractor to perform work in an amount in excess of 1/2 of 1 percent of the total bid (Pub Cont Code § 4100 et seq.).

The *Subcontractor List* submitted with the bid must show the name, location of business, work portions to be performed, and the contractor's license number for each subcontractor listed.

- Use subcontractor's business name style as registered with the License Board.

- Specify the city in which the subcontractor's business is located and the state if other than California.
- Description of the work to be performed by the subcontractor. Indicate with bid item numbers from the bid item list and/or work descriptions similar to those on bid item list.
- List license number and Department of Industrial Relations registration number for each subcontractor.

Upon request from Design Services, provide the following additional information within 24 hours of bid opening if not included on the *Subcontractor List* submitted with the bid:

- Complete physical address for each subcontractor listed.
- Percentage of the total bid or dollar amount associated with each subcontractor listed.

Equipment Certification – Proposal 9

Select "can" or "cannot" in accordance with instructions on form and return completed form with bid as part of bid submittal. Note that signing the bid constitutes signing this statement.

Resumes – Proposal 10

Provide resumes for the individuals who will work on the project as site supervisor and project manager. Provide no later than 4:00 PM on the fifth (5th) calendar day after bid opening if not included with the bid.

Experience References – Proposal 11

Provide references for each of three (3) projects. Provide the name of the person or entity for whom the work was performed, the email address and telephone number at which that person or entity can be contacted, and a description of the work performed. Provide no later than 4:00 PM on the fifth (5th) calendar day after bid opening if not included with the bid.

Proposal 12-16 – Not Used

Guaranty - Proposal 17

This document may, but does not need to be, submitted with the bid. It is part of the contract documents and must be separately signed and submitted by the contractor to whom the award is made, together with theexecuted Agreement.

2-1.33C(18) Proposal 18 - Title 13, California Code of Regulations § 2449(i) General Requirements for In-Use Off-Road Diesel-Fueled Fleets

Contractors, if applicable, must submit valid Certificates of Reported Compliance with their bid. Subcontractor certificates will be due no later than 4:00 PM on the fifth (5th) calendar day after the bid opening if not submitted with the bid.

2-1.33D Electronic Bid Document Completion

Electronic versions of the bid book documents are available online at http://www.BidExpress.com, and may be submitted through that website.
You must either attach an electronic bid bond or provide an original bid bond (or other form of bid security authorized by Public Contract Code Section 20129(a)), prior to the bid opening.
Bidders submitting online may use one of the accepted electronic sureties (SurePath or Surety 2000) to submit their bid bond; or may submit cash, cashier's check, certified check, or a bidder bond to Design Services at 2220 Tulare St., Seventh Floor, Fresno, CA 93721. Those submitting bid bonds directly to Design Services must submit their bid bond:

1. Under sealed cover
2. Marked as a bid-bond
3. Identifying the contract number and the bid opening date on the cover

2-1.34 BIDDER'S SECURITY

Submit one of the following forms of bidder's security equal to at least 10 percent of the bid:

1. Cash
2. Cashier's check
3. Certified check
4. Signed bidder's bond by an admitted surety insurer

Submit cash, cashier's check, certified check, or bidder's bond with your bid.

2-1.35–2-1.39 RESERVED

2-1.40 BID WITHDRAWAL

1. An authorized agent may withdraw a bid before the bid opening date and time by submitting a written bid withdrawal request at the location where the bid was submitted. Withdrawing a bid does not prevent you from submitting a new bid. An authorized agent is an individual authorized to submit a bid.
2. After the bid opening time, you cannot withdraw a bid.

2-1.41–2-1.42 RESERVED

2-1.43 BID OPENING

The Department publicly opens and reads bids at the time and place shown on the *Notice to Bidders*.

2-1.44–2-1.45 RESERVED

2-1.46 DEPARTMENT'S DECISION ON BID

The Department's decision on the bid amount is final.

The Department may reject:

1. All bids
2. A nonresponsive bid

2-1.47 BID RELIEF

The Department may grant bid relief under Pub Cont Code § 5100 et seq. Submit any request for bid relief to Design Services.

2-1.48 RESERVED

2-1.49 SUBMITTAL FAILURE HISTORY

The Department considers a bidder's past failure to submit documents required after bid opening in determining a bidder's responsibility.

2-1.50 BID RIGGING

Section 2-1.50 applies to a federal-aid contract.

The US Department of Transportation (DOT) provides a toll-free hotline to report bid rigging activities. Use the hotline to report bid rigging, bidder collusion, and other fraudulent activities. The hotline number is (800) 424-9071. The service is available 24 hours 7 days a week and is confidential and anonymous. The hotline is part of the DOT's effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General.

2-1.51 DISCLOSURE OF SELF-DEALING TRANSACTIONS

This provision is only applicable if the contractor is operating as a corporation (a for-profit or non-profit corporation) or if during the term of this agreement, the contractor changes its status to operate as a corporation.

Members of the contractor's Board of Directors shall disclose any self-dealing transactions that they are a party to while contractor is providing goods or performing services under this agreement. A self-dealing transaction shall mean a transaction to which the contractor is a party and in which one or more of its directors has a material financial interest. Members of the Board of Directors shall disclose any self-dealing transactions that they are a party to by completing and signing a Self-Dealing Transaction Disclosure Form which is included in *Project Details* of these special provisions.

In the event that the Contractor (to whom the project is awarded) is operating as a corporation or incorporates during the course of the construction contract, and any member of its board of directors is engaged or intends to become engaged in self-dealing transaction(s), each member of its board of

directors who is engaged or intends to become engaged in a self-dealing transaction or transactions must complete and submit to the County a completed Self-Dealing Transaction Disclosure Form (in Project Details) for each such transaction prior to engaging therein or immediately thereafter.

3 CONTRACT AWARD AND EXECUTION

Replace Section 3 with:

3-1.01 GENERAL

Section 3 includes specifications related to contract award and execution.

3-1.02 CONSIDERATION OF BIDS

3-1.02A General

Bids will be compared on the basis listed in the Notice to Bidders.

3-1.02B Tied Bids

The Department breaks a tied bid with a coin toss:

3-1.03 CONTRACTOR REGISTRATION

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.

3-1.04 CONTRACT AWARD

3-1.04A BID PROTEST PROCEDURES

Any bid protest must be submitted in writing and delivered by the Bidder by either of the following means: (1) via e-mail to DesignServices@fresnocountyca.gov; or (2) via certified mail, return receipt requested to the following address: Design Division, Department of Public Works and Planning, 2220 Tulare Street, Sixth Floor, Fresno, CA 93721.

The bid protest must be received no later than 5:00 p.m. of the seventh (7th) calendar day following the bid opening for any issues found within the bid itself, or 5:00 p.m. of the third (3rd) calendar day following the deadline for submittal of the specific bid document(s) placed at issue by the protest. Any Bidder filing a protest is encouraged to submit the bid protest via e-mail, because the deadline is based on the Department's receipt of the bid protest. A bid protest accordingly may be rejected as untimely if it is not received by the deadline, regardless of the date on which it was postmarked. The Bidder's compliance with the following additional procedures also is mandatory:

a. The initial protest document shall contain a complete statement of the grounds for the protest, including a detailed statement of the factual basis and any supporting legal authority.

b. The protest shall identify and address the specific portion of the document(s) forming the basis for the protest.

c. The protest shall include the name, address and telephone number of the person representing the protesting party.

d. The Department will provide a copy of the initial protest document and any attached documentation to all other Bidders or proposers who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.

e. The Board of Supervisors will issue a decision on the protest. If the Board of Supervisors determines that a protest is frivolous, the party originating the protest may be determined to be irresponsible and that party may be determined to be ineligible for future contract awards.

f. The procedure and time limits set forth herein are mandatory and are the Bidder's sole and exclusive remedy in the event of a bid protest. Failure by the Bidder to comply with these procedures shall constitute a waiver of any right to further pursue the bid protest, including the subsequent filing of a Government Code Claim or legal proceedings.

3-1.04B AWARD PERIOD

If the Department awards the contract, the award is made to the lowest responsible bidder within 54 calendar days after bid opening.

The Department may extend the specified award period if the Bidder agrees.

You may request to extend the award period by faxing a request to Design Services before 4:00 p.m. on or before the last day of the award period. If you do not make this request, after the specified award period:

1. Your bid becomes invalid
2. You are not eligible for the award of the contract

3-1.05 CONTRACT BONDS (PUB CONT CODE §§ 10221 AND 10222)

The successful bidder must furnish 2 bonds conforming to the requirements in the *Agreement* of these special provisions.

3-1.06 CONTRACTOR LICENSE

For a federal-aid contract, the Contractor must be properly licensed as a contractor from contract award through Contract acceptance (Pub Cont Code § 10164).

For a non-federal-aid contract:

1. Contractor must be properly licensed as a contractor from bid opening through Contract acceptance (Bus & Prof Code § 7028.15)
2. Joint venture bidders must obtain a joint venture license before contract award (Bus & Prof Code § 7029.1)

3-1.07 INSURANCE POLICIES

The successful bidder must submit copies of its insurance policies conforming to the requirements in the *Agreement* of these special provisions.

3-1.08 –3-1.10 RESERVED

3-1.11 PAYEE DATA RECORD

Complete and deliver to the Engineer a Payee Data Record form when requested by the Engineer.

3-1.12 RESERVED

3-1.13 FORM FHWA-1273

For a federal-aid contract, form FHWA-1273 is included with the Contract form in the documents sent to the successful bidder for execution. Comply with its provisions. Interpret the training and promotion section as specified in section 7-1.11A.

3-1.14–3-1.17 RESERVED

3-1.18 CONTRACT EXECUTION

The successful bidder must sign the *Agreement*.

Deliver to Design Services:

1. Signed *Agreement* including the attached form FHWA-1273
2. Contract bonds
3. Documents identified in section 3-1.07
4. For a federal-aid contract, *Local Agency Bidder - DBE Information* form

Design Services must receive these documents before the 10th business day after the bidder receives the contract.

The bidder's security may be forfeited for failure to execute the contract within the time specified (Pub Cont Code §§ 10181, 10182, and 10183).

3-1.19 BIDDERS' SECURITIES

The Department keeps the securities of the 1st, 2nd, and 3rd low bidders until the contract has been executed. The other bidders' securities, other than bidders' bonds, are returned upon determination of the 1st, 2nd, and 3rd low bidders, and their bidders' bonds are of no further effect (Pub Cont Code § 10184).

4 SCOPE OF WORK

Replace Section 4-1.02 with:

4-1.02 INTENT

The Contract intent is to provide for work completion using the best general practices.

Nothing in the specifications, special provisions, Standard Specifications, or in any other Contract document voids the Contractor's public safety responsibilities.

Replace Section 4-1.07C with:

4-1.07C Reserved

Replace Section 4-1.13 with:

4-1.13 CLEANUP

Before final inspection, leave the job site neat and presentable and dispose of:

1. Rubbish
2. Excess materials
3. Falsework
4. Temporary structures
5. Equipment

Remove warning, regulatory, and guide signs when directed by the Engineer.

5 CONTROL OF WORK

Delete the 9th Paragraph of Section 5-1.01

Add the following before the last sentence in Section 5-1.02

Caltrans Standard Plans, and any other other-agency Standard Drawings included in the “Project Details” section of the book entitled “Specifications” have the same ranking as Standard Plans.”

All other drawings in the “Project Details” section of the book entitled “Specifications” have the same ranking as Project Plans.

Tables and other documents in the “Project Details” section of the book entitled “Specifications” have the same ranking as Special Provisions. If a portion of a document in the Project Details section conflicts with the Special Provisions, the Special Provisions shall prevail.

Replace Section 5-1.09 with:

5-1.09 RESERVED

Replace Section 5-1.12 with:

5-1.12 ASSIGNMENT

No third-party agreement relieves you or your surety of the responsibility to complete the work. Do not sell, transfer, or otherwise dispose of any Contract part without prior written consent from the Department.

If you assign the right to receive Contract payments, the Engineer accepts the assignment upon the Engineer's receipt of a notice. Assigned payments remain subject to deductions and withholds described in

the Contract. The Department may use withheld payments for work completion whether payments are assigned or not.

A pending or disapproved request for assignment does not relieve you of the responsibility to commence and pursue work timely and in strict accordance with contract documents.

Replace Section 5-1.13C with:

5-1.13C RESERVED

Replace Section 5-1.13D with:

5-1.13D RESERVED

Add the following paragraph to the end of section 5-1.16 with:

Submit Daily Log records to the Engineer weekly for the entire course of work unless the Engineer requests another interval.

5-1.18 EXISTING ELECTRICAL LINES

The Contractor shall engage the services of a qualified utility locator service to positively identify the location of the buried 480-volt electrical line within the work area as shown on the Construction Drawings. Non-invasive methods shall be employed. No pot holing or excavations of any type shall be allowed above or in the vicinity of the buried 480-volt electrical line. Once the buried 480-volt electrical line is located, Contractor shall install visible markers identifying the alignment of the buried line, and maintain them for the duration of the Project.

Replace Section 5-1.20B(4) with:

5-1.20B(4) Contractor–Property Owner Agreement

Before any materials are stockpiled or equipment parked / stored within the American Avenue Landfill limits, the Contractor shall first obtain written authorization from the property owner whose property the materials are to be stockpiled or equipment parked/stored. That written authorization shall be in the form of the Notice to Proceed from the County of Fresno. The Contractor shall file with the Engineer said authority or a certified copy thereof together with a written release absolving the County of Fresno from any and all responsibility in connection with the stockpiling of materials or parking/storage of equipment on said Storage Area. Before any material is stockpiled or equipment parked/stored, the Contractor shall obtain written permission from the Engineer to stockpile materials or park/store equipment at the location designated in said authorization. **Failure by the Contractor to provide written authorization shall result in the withholding of all funds due to the Contractor until said authorization is received by the County.**

The Contractor is required to obtain all permits required by all applicable regulatory agencies and to comply with all applicable codes, regulations and zoning ordinances prior to establishing a storage yard for materials and/or equipment. The Contractor shall provide copies of all permits acquired to the Engineer.

Before procuring material from or disposing or stockpiling of material on non-highway property:

1. Provide proof that the property where materials are to be stockpiled or equipment parked/stored is appropriately zoned and/or permitted for the use proposed by the Contractor.
2. Obtain written authorization from each and every owner of the property where materials are to be stockpiled or equipment parked/stored.
3. Provide proof that the signor(s) of the authorization are the owners of the property.
4. Provide an executed release from the property owner(s) absolving the Department from any and all responsibility in connection with the stockpiling of materials or parking/storage of equipment on said property.
5. Obtain written permission from the Engineer to stockpile materials or park/store equipment at the location designated in said authorization.

Before Contract acceptance, submit a document signed by the owner of the material source or disposal site stating that the Contractor has complied with the Contractor-owner agreement.

Failure by the Contractor to provide written authorization shall result in the withholding of all funds due to the Contractor until said authorization is received by the County.

Replace Section 5-1.23A with:

5-1.23A General

Section 5-1.23 includes specifications for action and informational submittals.

Any submittal not specified as an informational submittal is an action submittal.

Submit action and informational submittals to the Engineer. Unless otherwise specified in these Specifications, submittals shall be provided via email in .pdf format.

Each submittal must have a cover sheet that must include:

1. Contract number
2. Project Name
3. Date
4. Submittals (and resubmittals if applicable) must be numbered sequentially. For revised submittals add a decimal, e.g. 1.0, 1.1, 1.2, etc.
5. Structure number if applicable
6. Contractor
7. Person responsible for submitting the submittal
8. Signature of Contractor's representative sending submittal
9. Section number and/or item submittal is referencing
10. Pages of submittal, excluding cover sheet
11. Provide space for Contractor, County and/or Engineer's review stamps

The Department rejects a submittal if it has any error or omission.

If the last day for submitting a document falls on a Saturday or holiday, it may be submitted on the next business day with the same effect as if it had been submitted on the day specified.

Documents must be submitted in the English language.

Convert documents to US customary units.

Replace Section 5-1.26 with:

5-1.26 CONSTRUCTION SURVEYS

The Engineer places stakes and/or marks only as indicated in these specifications. .

Submit your request for Engineer-furnished stakes:

1 Once staking area is ready for stakes
2. On a Request for Construction Stakes form

After your submittal, the Engineer starts staking within 2 working days.

Preserve stakes and marks placed by the Engineer. If the stakes or marks are destroyed, the Engineer replaces them at the Engineer's earliest convenience and deducts the cost.

5-1.26A GENERAL

1.1 SUMMARY

A. Section includes general requirements for survey work to be provided by the Contractor for the following:

1. Setting offset stakes, slope stakes, and grade stakes for field layout of features for performance of the Work.
2. Surveys for measurement of quantities for payment for all pay items and progress

payment for final pay items.

3. As-built Drawings.

1.2 DESCRIPTION

A. Control and Reference Points. The control and reference points provided by the County include monuments and elevation benchmarks in the vicinity of the Project. If displaced during the project, replacement of these reference points will be at the expense of the Contractor.

B. The Engineer reserves the right to perform any desired checking and correction of the Contractor's layout work relative to County's surveys but this does not relieve the Contractor of the responsibility for adequate performance of their Work.

C. Equipment and Personnel. Provide instruments and other survey equipment that are accurate, suitable for the surveys required in accordance with recognized professional standards and in proper condition and adjustment at all times. Perform surveys under the direct supervision of a California licensed professional surveyor.

D. Field Notes and Records. Record surveys in field notebooks or approved electronic device.

E. Use by the County. The County may at any time use line and grade points and markers established by the Engineer or Contractor. The Contractor's surveys are a part of the Work and may be checked by the County or representatives of the County at any time.

F. Contractor will furnish all necessary detail surveys including all lines, grades, and elevation appropriate to control construction. At a minimum, construction surveys are required for final grades of Modules 9 and 10, finished grades for access roads, side ditches and winter pad.

1.3 SURVEYS FOR LAYOUT AND PERFORMANCE WORK

A. Vertical datum for all surveys is NGVD 29. Horizontal control is a local ground coordinate system as specified on the Construction Plans, no projection, no datum.

B. Contractor will perform all surveys for layout of the work, reduce the field notes, make necessary calculations, and prepare drawings necessary to carry out such work. Contractor's layout work will include:

1. Slope staking for Modules 9 and 10 excavation grading at 50-foot grid and grade breaks.
2. All as-built surveys specified in this section.
3. Surveys to measure completed units of work specified in this section.

C. Contractor must perform all additional slope staking, off-setting, and other control staking necessary to perform the work.

D. The Engineer will perform subgrade checks as stated in Section 19-4 LANDFILL EARTHWORK and may perform independent checks along access roads.

1.4 SURVEYS FOR AS-BUILTS AND MEASUREMENT FOR PAYMENT

When the Specifications or Engineer require Bid Schedule items of work to be measured by surveying methods, Contractor shall perform the surveys unless noted otherwise in Section 9 of these special provisions. All such surveys, including control surveys for

establishing the measurement reference lines, shall be performed by a duly qualified and California licensed surveyor in the presence of the Contractor who will provide notice so Engineer may witness the surveying operation. Engineer may independently check calculations of final quantities for payment purposes. A duplicate of the note reductions and calculations will be given to the Engineer. All calculated quantities shall be certified by a California licensed surveyor as to accuracy.

For surveys a 50-foot as-built grid shall be used to confirm minimum thicknesses and lines and grades of finished surfaces.

Contractor will provide the Engineer with As-Built Drawings that show the listed items below. Contractor will submit survey information for items listed above to the Engineer before the items are covered.

1. Topography that depicts the finish grade of Module 9 & 10 subgrade including all grades within the limits of Module 9 & 10 excavation.
2. Topography that depicts the finish grade of Module 9 & 10 Operations layer.
3. Topography that depicts flow line, edge line and center line of access road, toe and top of embankments at 50 ft intervals
4. Invert and top elevation of culverts.
5. Leachate and Lysimeter pipe invert at 50 ft intervals
6. Perimeter of the installed Geomembrane at 50 ft intervals

Contractor will provide As-Built Drawings on 22" x 34" size drawings, and on computer disk in an approved version of AutoCAD. Use the coordinate system shown on the Construction Drawings. The As-Built Drawings shall show all relevant features of the phase, including access roads, contours (2-ft. interval), aerial survey control points, hinge lines, and coordinates of all riser pipes, and other permanent design related structures.

1.5 SURVEYING ACCURACY AND TOLERANCES IN SETTING OF SURVEY STAKES

The tolerances applicable in setting survey stakes are as set forth below. Such tolerances cannot supersede stricter tolerances required by the Construction Drawings or Specifications, and cannot otherwise relieve the Contractor of responsibility for measurements in compliance therewith.

Type of Mark	Horizontal Position	Elevation
Permanent reference points	±0.03 ft.	±0.01 ft.
General excavation and earthwork	±0.15 ft.	±0.10 ft.

Tolerances for designed thickness shown on the Construction Drawings and for elevations shown on the Construction Drawings are ±0.10 foot unless otherwise specified.

Surveyor must be licensed in the State of California.

Replace Section 5-1.27E with:

5-1.27E CHANGE ORDER BILLS

Maintain separate records for change order work costs.

5-1.32 AREAS FOR USE

Occupy the highway only for purposes necessary to perform the work.

Defend, indemnify, and hold the Department harmless to the same extent as under section 7-1.05.

The Department does not allow temporary residences within the County right-of-way.

6 CONTROL OF MATERIALS

Replace section 6-1.05 with:

6-1.05 SPECIFIC BRAND OR TRADE NAME AND SUBSTITUTION

Unless substitution is expressly precluded in the special provisions, a reference to a specific brand or trade name establishes a quality standard and is not intended to limit competition. Unless the Department has made a public interest finding expressly authorizing sole source procurement of a particular item, you may use a product that is equal to or better than the specified brand or trade name if authorized.

Submit a substitution request with a time period that:

1. Follows Contract award
2. Allows 30 days for review
3. Causes no delay

Include substantiating data with the substitution request that proves that substitution:

1. Causes no delay
2. Is of equal or better quality and suitability

If the special provisions disallow substitution of a particular item, provide the specified item and do not propose substitution.

The Department has made a public interest finding and has determined that the following items shall be used for the project, and no substitution therefor shall be allowed.

- WSDPT 3-5 SurePump from EPG
- Promag P 300 5P3B25-4RD5/0 from Endress-Hauser
- Kayo 9 slot programmable logic controller (PLC), Automation Direct D2-250-1-CPU, with H2-ECOM-100 Ethernet interface module and EA7-T6CL HMI display from Automation Direct PLC
- MOXA AWK-3121 US-T Ethernet Wi-Fi radio modem (for high temperature range) from MOXA Corporate Plaza

7 LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

Add to Section 7-1.02C:

In conformance with Title 13 § 2449(i), between March 1 and June 1 of each year, new valid Certificates of Reported Compliance for the current compliance year, as defined in section 2449(n) for the Contractor and all applicable subcontractors must be submitted. Submit new valid Certificates of Reported Compliance to the Engineer at least one week prior to the expiration date of the current certificate.

Replace the 2nd Paragraph of Section 7-1.02K(2) with:

The general prevailing wage rates and any applicable changes to these wage rates are available:

1. From Design Services
2. From the Department of Industrial Relations' Web site

Replace section 7-1.02K(3) with:

Keep accurate payroll records.

Submit a copy of your certified payroll records, weekly, including those of subcontractors. Include:

1. Each employee's:
    1.1. Full name
    1.2. Address
    1.3. Social security number
    1.4. Work classification
    1.5. Straight time and overtime hours worked each day and week
    1.6. Actual wages paid for each day to each:
        1.6.1. Journeyman
        1.6.2. Apprentice
        1.6.3. Worker
        1.6.4. Other employee you employ for the work
    1.7. Pay rate
    1.8. Itemized deductions made
    1.9. Check number issued
    1.10. Fringe Benefits
2. Apprentices and the apprentice-to-journeyman ratio

Each certified payroll record must include a Statement of Compliance form signed under penalty of perjury that declares:

1. Information contained in the payroll record is true, correct, and complete
2. Employer has complied with the requirements of sections 1771, 1811, and 1815 for any work performed by his or her employees on the public works project
3. Wage rates paid are at least those required by the Contract

Submitted certified payrolls for hauling and delivering ready-mixed concrete must be accompanied by a written time record. The time record must include:

1. Truck driver's full name and address
2. Name and address of the factory or batching plant
3. Time the concrete was loaded at the factory or batching plant
4. Time the truck returned to the factory or batching plant
5. Truck driver's signature certifying under penalty of perjury that the information contained in this written time record is true and correct

Make certified payroll records available for inspection at all reasonable hours at your main office on the following basis:

1. Upon the employee's request or upon request of the employee's authorized representative, make available for inspection a certified copy of the employee's payroll record.
2. Refer the public's requests for certified payroll records to the Department. Upon the public's request, the Department makes available for inspection or furnishes copies of your certified payroll records. Do not give the public access to the records at your main office.

Make all payroll records available for inspection and copying or furnish a copy upon request of a representative of the:

1. Department
2. Division of Labor Standards Enforcement of the Department of Industrial Relations
3. Division of Apprenticeship Standards of the Department of Industrial Relations

Furnish the Department the location of the records. Include the street address, city, and county. Furnish the Department a notification of a location and address change within 5 business days of the change.

Comply with a request for the records within 10 days after you receive a written request. If you do not comply within this period, the Department withholds from progress payments a $100 penalty for each day

or part of a day for each worker until you comply. You are not assessed this penalty for a subcontractor's failure to comply with Labor Code § 1776.

The Department withholds from progress payments for delinquent or inadequate records (Labor Code § 1771.5). If you have not submitted an adequate record by the month's 15th day for the period ending on or before the 1st of that month, the Department withholds up to 10 percent of the monthly progress estimate, exclusive of mobilization. The Department does not withhold more than $10,000 or less than $1,000.

Add to Section 7-1.02K(6) (a):

The Contractor shall prepare and submit a **Health and Safety Plan (HASP)** outlining the Contractor's health and safety program considering the site specific hazards associated with the work to be completed

SPECIAL SAFETY PRECAUTIONS

A. This work will be performed at an active waste disposal site. County and public vehicles will generally not be restricted in their use of the site. The Contractor shall take all precautions to protect County equipment and staff, the general public, and their own workers. The IIPP shall address personnel and traffic safety procedures.

B. Because this project is located at an active landfill site and possibly in an area subject to landfill gas migration, the Contractor shall become familiar with the potential hazards associated with landfill gas.

C. The following landfill and gas related information is included to assist the Contractor and is not intended to encompass all aspects to protect the workers or to comply with applicable regulations.

POTENTIAL FOR HAZARDS

A. Landfill gases usually vent to the atmosphere through the cover soils and exposed wastes but may migrate laterally to adjacent areas depending on site and weather conditions.

B. Landfill gases have the potential to create the following hazardous conditions if not controlled or recognized:

1. Fires may start spontaneously from exposed and/or decomposing refuse.
2. Fires and explosions may occur from the presence of methane gas.
3. Landfill gases may cause an oxygen deficiency in underground trenches, excavations, vaults, conduits, and structures.
4. Hydrogen sulfide, a highly toxic and flammable gas, or other toxic gas may be present.
5. Possible caving of trenches and excavations may occur when working over or in refuse fills and excavations.

SAFETY PRECAUTIONS

A. In addition to conforming to the safety rules and regulations of governmental authorities having jurisdiction, the Contractor shall take the following precautionary measures:

6. Smoking and vaping is prohibited on the landfill property.
7. The use of explosives or firearms is prohibited on the site.

B. The Contractor may encounter explosive and/or toxic gases during construction. If gases are encountered within the project area the Contractor will stop work and notify the

County, Engineer, OSHA, Cal-OSHA and all other agencies requiring notification.

C. If gases are encountered, all of the Contractors and employees working within the area will need to have hazardous waste operations and emergency response (HAZWOPER) training.

D. Contractor's site specific safety program, in the form of an IIPP, shall include the following measures at a minimum:

1. Shall comply with the requirements of OSHA, Cal-OSHA and all other regulatory agency requirements.
2. Inhalation of landfill gases shall be avoided. Such gases or oxygen deficient air may cause nausea and dizziness, which could lead to accidents. Work should proceed in a direction upwind of the excavation where possible, unless the excavation is constantly monitored and declared safe.
3. Workers shall avoid contact with exposed refuse, condensate, or leachate. Irritants or hazardous materials may be present.
4. Fire extinguishers with a rating of at least A, B, and C shall be available at all times on the Site.
5. Start-up and shutdown of equipment shall be avoided in areas of exposed refuse.

Replace Section 7-1.02M(2) with:

7-1.02M(2) Fire Prevention

Cooperate with local fire prevention authorities in eliminating hazardous fire conditions.

Obtain the phone numbers of the nearest fire suppression agency, California Department of Forestry and Fire Protection (Cal Fire) unit headquarters, United States Forest Service (USFS) ranger district office, and U.S. Department of Interior (USDI) BLM field office. Submit these phone numbers to the Engineer before the start of job site activities.

Immediately report to the nearest fire suppression agency fires occurring within the project limits.

Prevent project personnel from setting open fires that are not part of the work.

Prevent the escape of and extinguish fires caused directly or indirectly by job site activities

Except for motor trucks, truck tractors, buses, and passenger vehicles, equip all hydrocarbon-fueled engines, both stationary and mobile including motorcycles, with spark arresters that meet USFS standards as specified in the *Forest Service Spark Arrester Guide*. Maintain the spark arresters in good operating condition. Spark arresters are not required by Cal Fire, the BLM, or the USFS on equipment powered by properly maintained exhaust-driven turbo-charged engines or equipped with scrubbers with properly maintained water levels. The *Forest Service Spark Arrester Guide* is available at the district offices.

Each toilet must have a metal ashtray at least 6 inches in diameter by 8 inches deep half-filled with sand and within easy reach of anyone using the facility.

Locate flammable materials at least 50 feet away from equipment service, parking, and gas and oil storage areas. Each small mobile or stationary engine site must be cleared of flammable material for a radius of at least 15 feet from the engine.

Each area to be cleared and grubbed must be cleared and kept clear of flammable material such as dry grass, weeds, brush, downed trees, oily rags and waste, paper, cartons, and plastic waste. Before clearing and grubbing, clear a fire break at the outer limits of the areas to be cleared and grubbed. Other fire breaks may be ordered and are change order work.

Furnish the following fire tools:

1. 1 shovel and 1 fully charged fire extinguisher UL rated at 4 B:C or more on each truck, personnel vehicle, tractor, grader, or other heavy equipment.

2. 1 shovel and 1 backpack 5-gallon water-filled tank with pump for each welder.
3. 1 shovel or 1 chemical pressurized fire extinguisher, fully charged, for each gasoline-powered tool, including chain saws, soil augers, and rock drills. The fire tools must always be within 25 feet from the point of operation of the power tool. Each fire extinguisher must be of the type and size required by the Pub Res Code § 4431 and 14 CA Code of Regs § 1234. Each shovel must be size O or larger and at least 46 inches long.

In addition to being available at the site of the work, the truck and operator must patrol the area of construction from noon until at least 1/2 hour after job site activities have ended. If the fire danger rating is very high or extreme, the truck and operator must patrol the area of construction while work is being done and for at least 1/2 hour after job site activities have ended.

Cal Fire, USFS, and BLM have established the following adjective class ratings for 5 levels of fire danger for use in public information releases and fire protection signing: low, moderate, high, very high, extreme. Obtain the fire danger rating daily for the project area from the nearest Cal Fire unit headquarters, USFS ranger district office, or BLM field office.

Arrangements have been made with Cal Fire, USFS, and BLM to notify the Department when the fire danger rating is very high or extreme. This information will be furnished to the Engineer who will notify you for dissemination and action in the area affected. If a discrepancy between this notice and the fire danger rating obtained from the nearest office of either Cal Fire or USFS exists, you must conduct operations according to the higher of the two fire danger ratings.

If the fire danger rating reaches very high:

1. Falling of dead trees or snags must be discontinued.
2. No open burning is permitted and fires must be extinguished.
3. Welding must be discontinued except in an enclosed building or within an area cleared of flammable material for a radius of 15 feet.
4. Blasting must be discontinued.
5. Smoking is allowed only in automobiles and cabs of trucks equipped with an ashtray or in cleared areas immediately surrounded by a fire break unless prohibited by other authority.
6. Vehicular travel is restricted to cleared areas except in case of emergency.

If the fire danger rating reaches extreme, take the precautions specified for a very high fire danger rating except smoking is not allowed in an area immediately surrounded by a firebreak and work of a nature that could start a fire requires that properly equipped fire guards be assigned to such operation for the duration of the work.

The Engineer may suspend work wholly or in part due to hazardous fire conditions. The days during this suspension are non–working days.

If field and weather conditions become such that the determination of the fire danger rating is suspended, section 7-1.02M(2) will not be enforced for the period of the suspension of the determination of the fire danger rating. The Engineer will notify you of the dates of the suspension and resumption of the determination of the fire danger rating.

Add between the 9th and 10th paragraphs of section 7-1.03:

07-15-16

If a height differential of more than 0.04 foot is created by construction activities at a joint transverse to the direction of traffic on the traveled way or a shoulder subject to public traffic, construct a temporary taper at the joint with a slope complying with the requirements shown in the following table:

Temporary Tapers

Height differential (foot)	Slope (horizontal:vertical)	
	Taper use of 14 days or less	Taper use of more than 14 days
Greater than 0.08	100:1 or flatter	200:1 or flatter
0.04–0.08	70:1 or flatter	70:1 or flatter

For a taper on existing asphalt concrete or concrete pavement, construct the taper with minor HMA under section 39-2.07.

Grind existing surfaces to accommodate a minimum taper thickness of 0.10 foot under either of the following conditions:

1. HMA material such as rubberized HMA, polymer-modified bonded wearing course, or open-graded friction course is unsuitable for raking to a maximum 0.02 foot thickness at the edge
2. Taper will be in place for more than 14 days

For a taper on a bridge deck or approach slab, construct the taper with polyester concrete under section 60-3.04B.

The completed surface of the taper must be uniform and must not vary more than 0.02 foot from the lower edge of a 12-foot straightedge when placed on its surface parallel and perpendicular to traffic.

If authorized, you may use alternative materials or methods to construct the required taper.

Replace Section 7-1.04 with:

7-1.04 PUBLIC SAFETY

7-1.04A GENERAL

You are responsible to provide for public safety.

Do not construct a temporary facility that interferes with the safe passage of traffic.

Control dust resulting from the work, inside and outside the right-of-way.

Move workers, equipment, and materials without endangering traffic.

Whenever your activities create a condition hazardous to the public, furnish, erect and maintain those fences, temporary railing, barricades, lights, signs, and other devices and take any other necessary protective measures to prevent damage or injury to the public.

Any fences, temporary railing, barricades, lights, signs, or other devices furnished, erected and maintained by you are in addition to those for which payment is provided elsewhere in the specifications.

Provide flaggers whenever necessary to ensure that the public is given safe guidance through the work zone. At locations where traffic is being routed through construction under one-way controls, move your equipment in compliance with the one-way controls unless otherwise ordered.

Use of signs, lights, flags, or other protective devices must comply with the *California MUTCD* and any directions of the Engineer. Signs, lights, flags or other protective devices must not obscure the visibility of, nor conflict in intent, meaning, and function of either existing signs, lights and traffic control devices, or any construction area signs.

Keep existing traffic signals and highway lighting in operation. Other forces within the Department will perform routine maintenance of these facilities during the work.

Cover signs that direct traffic to a closed area.

Install temporary illumination in a manner which the illumination and the illumination equipment does not interfere with public safety. The installation of general roadway illumination does not relieve you from furnishing and maintaining any protective devices.

Equipment must enter and leave the highway via existing ramps and crossovers and must move in the direction of traffic. All movements of workmen and construction equipment on or across lanes open to traffic must be performed in a manner that do not endanger the public. Your vehicles or other mobile equipment leaving an open traffic lane to enter the construction area must slow down gradually in advance of the location of the turnoff to give the traffic following an opportunity to slow down. When leaving a work area and entering a roadway carrying traffic, your vehicles and equipment must yield to traffic.

Immediately remove hauling spillage from a roadway lane or shoulder open to traffic. When hauling on roadways, trim loads and remove material from shelf areas to minimize spillage.

Notify the Engineer not less than 5 days before the anticipated start of an activity that will change the vertical or horizontal clearance available to traffic, including shoulders.

If vertical clearance is temporarily reduced to 15.5 feet or less, place low clearance warning signs in compliance with the *California MUTCD* and any directions of the Engineer. Signs must comply with the

dimensions, color, and legend requirements of the *California MUTCD* and section 12-3.06 except that the signs must have black letters and numbers on an orange retroreflective background. W12-2P signs must be illuminated so that the signs are clearly visible.

Pave or provide full width continuous and cleared wood walks for pedestrian openings through falsework. Protect pedestrians from falling objects and concrete-curing water. Extend overhead protection for pedestrians at least 4 feet beyond the edge of the bridge deck. Illuminate all pedestrian openings through falsework. Temporary pedestrian facilities must comply with the *California MUTCD*, Part 6, Chapter 6D, "Pedestrian and Worker Safety."

Do not store vehicles, material, or equipment in a way that:

1. Creates a hazard to the public
2. Obstructs traffic control devices

Do not install or place temporary facilities used to perform the work which interfere with the free and safe passage of traffic.

Temporary facilities that could be a hazard to public safety if improperly designed must comply with design requirements described in the Contract for those facilities or, if none are described, with standard design criteria or codes appropriate for the facility involved. Submit shop drawings and design calculations for the temporary facilities and show the standard design criteria or codes used. Shop drawings and supplemental calculations must be sealed and signed by an engineer who is registered as a civil engineer in the State.

If you appear to be neglectful or negligent in furnishing warning devices and taking protective measures, the Engineer may direct your attention to the existence of a hazard. You must furnish and install the necessary warning devices. If the Engineer points out the inadequacy of warning devices and protective measures, that action on the part of the Engineer does not relieve you from your responsibility for public safety or abrogate your obligation to furnish and pay for these devices and measures.

Install Type K temporary railing or other authorized protective systems under any of the following conditions:

1. Excavations: Where the near edge of the excavation is within 15 feet from the edge of an open traffic lane
2. Temporarily unprotected permanent obstacles: When the work includes the installation of a fixed obstacle together with a protective system, such as a sign structure together with protective railing, and you elect to install the obstacle before installing the protective system; or you, for your convenience and as authorized, remove a portion of an existing protective railing at an obstacle and do not replace such railing completely the same day
3. Storage areas: When material or equipment is stored within 15 feet of the edge of an open traffic lane and the storage is not otherwise prohibited by the Contract
4. Height differentials: When construction operations create a height differential greater than 0.15 feet within 15 feet of the edge of traffic lane

Installation of Type K temporary railing is not required if an excavation within 15 feet from the edge of an open traffic lane is protected by any of the following:

1. Steel plate or concrete covers of adequate thickness to prevent accidental entry by traffic or the public
2. Side slope where the downhill slope is 4:1 (horizontal: vertical) or less unless a naturally occurring condition
3. Barrier or railing

Offset the approach end of Type K temporary railing a minimum of 15 feet from the edge of an open traffic lane. Install the temporary railing on a skew toward the edge of the traffic lane of not more than 1 foot transversely to 10 feet longitudinally with respect to the edge of the traffic lane. If the 15-foot minimum offset cannot be achieved, the temporary railing must be installed on the 10 to 1 skew to obtain the maximum available offset between the approach end of the railing and the edge of the traffic lane, and an array of temporary crash cushion modules must be installed at the approach end of the temporary railing.

Secure Type K temporary railing in place before starting work for which the temporary railing is required.

Where 2 or more lanes in the same direction are adjacent to the area where the work is being performed, including shoulders, the adjacent lane must be closed under any of the following conditions:

1. Work is off the traveled way but within 6 feet of the edge of the traveled way, and the approach speed is greater than 45 miles per hour
2. Work is off the traveled way but within 3 feet of the edge of the traveled way, and the approach speed is less than 45 miles per hour

Closure of the adjacent traffic lane is not required when performing any of the following:

1. Working behind a barrier
2. Paving, grinding, or grooving
3. Installing, maintaining, or removing traffic control devices except Type K temporary railing

Do not reduce an open traffic lane width to less than 10 feet. When traffic cones or delineators are used for temporary edge delineation, the side of the base of the cones or delineators nearest to traffic is considered the edge of the traveled way.

If a traffic lane is closed with channelizers for excavation work, move the devices to the adjacent edge of the traveled way when not excavating. Space the devices as specified for the lane closure.

Do not move or temporarily suspend anything over a traffic lane open to the public unless the public is protected.

7-1.04B WORK ZONE SAFETY AND MOBILITY

7-1.04B(1) POLICY

In order to ensure safe and efficient flow of traffic through work zones, the County of Fresno, via its General Plan, Transportation and Circulation Element, Policy TRA-1, has adopted the use of AASHTO Standards as supplemented by Caltrans and County Department of Public Works and Planning Standards.

7-1.04B(2)TRAFFIC MANAGEMENT PLAN

Perform traffic management shall be in accordance with Section 12, “TEMPORARY TRAFFIC CONTROL,” of these special provisions.

7-1.04B(3)TEMPORARY TRAFFIC CONTROL PLAN

Prepare traffic control plan(s) in accordance with Section 12, “TEMPORARY TRAFFIC CONTROL,” of these special provisions.

7-1.04B(4)PUBLIC INFORMATION

Provide notice to public agencies and others to the extent required, if any, elsewhere in these special provisions. The Engineer provides other noticing not identified to be performed by the Contractor.

Replace Section 7-1.06 with:

7-1.06 INSURANCE

7-1.06A General

Nothing in the Contract is intended to establish a standard of care owed to any member of the public or to extend to the public the status of a third-party beneficiary for any of these insurance specifications.

7-1.06B Casualty Insurance

Obtain and maintain insurance on all of your operations with companies acceptable to the Department as follows:

1. Keep all insurance in full force and effect from the start of the work through Contract acceptance.
2. All insurance must be with an insurance company with a rating from A.M. Best Financial Strength Rating of A or better and a Financial Size Category of VIII or better.
3. Maintain completed operations coverage with a carrier acceptable to the State through the expiration of the patent deficiency in construction statute of repose set forth in Civ Pro Code § 337.1.

7-1.06C Workers' Compensation and Employer's Liability Insurance

Under Labor Code § 1860, secure the payment of worker's compensation under Labor Code § 3700.

Submit to the Department the following certification before performing the work (Labor Code § 1861):

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.

Contract signing constitutes certification submittal.

Provide Employer's Liability Insurance in amounts not less than:

1. $1,000,000 for each accident for bodily injury by accident
2. $1,000,000 policy limit for bodily injury by disease
3. $1,000,000 for each employee for bodily injury by disease

If there is an exposure of injury to your employees under the U.S. Longshoremen's and Harbor Workers' Compensation Act, the Jones Act, or under laws, regulations, or statutes applicable to maritime employees, coverage must be included for such injuries or claims.

7-1.06D Liability Insurance

7-1.06D(1) General

Carry General Liability and Umbrella or Excess Liability Insurance covering all operations by or on behalf of you providing insurance for bodily injury liability and property damage liability for the following limits and including coverage for:

1. Premises, operations and mobile equipment
2. Products and completed operations
3. Broad form property damage (including completed operations)
4. Explosion, collapse, and underground hazards
5. Personal injury
6. Contractual liability

7-1.06D(2) Liability Limits/Additional Insureds

Refer to the *Agreement* of these special provisions

Additional insured coverage must be provided by a policy provision or by an endorsement providing coverage at least as broad as *Additional Insured* (Form B) endorsement form CG 2010, as published by the Insurance Services Office (ISO), or other form designated by the Department.

7-1.06D(3) Contractor's Insurance Policy is Primary

The policy must stipulate that the insurance afforded the additional insureds applies as primary insurance. Any other insurance or self-insurance maintained by the State is excess only and must not be called upon to contribute with this insurance.

7-1.06E Automobile Liability Insurance

Comply with requirements in the *Agreement* of these special provisions

7-1.06F Policy Forms, Endorsements, and Certificates

Provide your General Liability Insurance under Commercial General Liability policy form no. CG0001 as published by the Insurance Services Office (ISO) or under a policy form at least as broad as policy form no. CG0001.

7-1.06G NOT USED

7-1.06H Enforcement

The Department may assure your compliance with your insurance obligations. Ten days before an insurance policy lapses or is canceled during the Contract period you must submit to the Department evidence of renewal or replacement of the policy.

If you fail to maintain any required insurance coverage, the Department may maintain this coverage and withhold or charge the expense to you or terminate your control of the work.

You are not relieved of your duties and responsibilities to indemnify, defend, and hold harmless the State, its officers, agents, and employees by the Department's acceptance of insurance policies and certificates.

Minimum insurance coverage amounts do not relieve you for liability in excess of such coverage, nor do they preclude the State from taking other actions available to it, including the withholding of funds under this Contract.

7-1.06I Self-Insurance

Comply with the *Agreement* of these special provisions

Replace Section 7-1.07 with:

7-1.07 LEGAL ACTIONS AGAINST THE DEPARTMENT

7-1.07A General

If legal action is brought against the Department over compliance with a State or federal law, rule, or regulation applicable to highway work, then:

1. If the Department in complying with a court order prohibits you from performing work, the resulting delay is a suspension related to your performance, unless the Department terminates the Contract.
2. If a court order other than an order to show cause or the final judgment in the action prohibits the Department from requiring you to perform work, the Department may delete the prohibited work or terminate the Contract.

7-1.07C Claims

This section applies to non-seal coat projects which involve asphalt concrete paving. Pay for claims for personal property damage caused by your work. Claims are limited to:

1. 10 percent of the total bid

Within 30 days of the last working day placement of hot mix asphalt, do the following:

1. Process and resolve all claims reported or submitted to you by the public as follows:
   1.1. Within 3 business days of receipt of a claim, submit to the Department a copy of the claim, a written analysis of the claim, and a statement indicating whether or not you will pay the claim. If you reject a claim, provide the reasons for rejection in writing.
   1.2. If the claimant becomes dissatisfied with your handling of the claim, immediately refer the claimant to the local district claims office for assistance in resolving the claim.
2. Submit to the Department evidence of your paid claims.

All claims presented to the Department, (Govt Code § 900 et seq.) are processed and resolved by the Department as follows:

1. The claims are processed as formal government claims subject to all laws and policies and are resolved as the Department determines including referring the claim to you for handling.
2. If the Department approves settlement of a claim or is ordered to pay pursuant to a court order, the claim is paid from funds withheld from you.
3. Within 3 business days of the Department's determination that you are responsible for resolving the claim, the Department sends a copy of the claim to you for resolution or notifies you of the Department's decision to resolve the claim.

The Department withholds an amount not to exceed 5 percent of the total bid to resolve all claims. The amount is held no longer than 60 days following the last working day so that the Department has ample time to resolve any pending claims. After 60 days, any remaining amount withheld is returned to you.

If no withheld funds remain or have been returned, the Department may pay any claims and seek reimbursement from you through an offset or any other legal means. Any reimbursement or offset to be recovered from you, including all other paid claims, is limited to 10 percent of the total bid.

Section 7-1.07C does not limit your obligation to defend and indemnify the Department.

Add between the 1st and 2nd paragraphs of section 7-1.11A:

Comply with 46 CFR 381.7(a)–(b).

8 PROSECUTION AND PROGRESS

Replace Section 8 with:

8-1.01 GENERAL

Section 8 includes specifications related to prosecuting the Contract and work progress.

8-1.01A Work Hours

Perform all work on working days between the hours of 6:00 a.m. and 6:00 p.m (working Hours). The site gate will open at 7:00 a.m. and shall be closed by 3:00 p.m. Monday – Friday. The landfill is closed on Sunday and Holidays. The site shall be cleared by 6:00 PM without exception.

The Contractor may request approval to work on a holiday or on a non-working day. If, pursuant to such a request ,and the Engineer authorizes the Contractor to work on a holiday or on a non-working day, the Contractor shall pay the actual cost incurred by the Department to perform all inspection, surveying, testing, and all other project-related work by the Department on such holiday or non-working day. Such payment will be deducted from monies due or which may become due to the Contractor.

Plan work so that all construction operations performed each day, including cleanup of the project site, establishment of appropriate traffic control and any other work necessary for the safety of the public shall be completed within the working hours listed above.

If the Contractor fails to complete work during the above-mentioned working hours, the Engineer will stop all work and order contractor to perform any and all work the Engineer deems necessary to ensure the safety of the public and ensure the site is cleared by 6:00 p.m.

The Contractor is not entitled to any additional compensation or extension of the contract time as a result of the Engineer stopping the work due to the approaching end of the day's approved working hours.

8-1.02 SCHEDULE

8-1.02A General

Upon completion of all work, the Department returns the withholds associated with section 8-1.02 and makes a payment adjustment for work not performed in the same manner as work-character changes.

8-1.02B Level 1 Critical Path Method Schedule

8-1.02B(1) General

No pay item is provided for Level 1 Critical Path Project Schedule. Payment is considered to be included in the various items of work.

Before or at the preconstruction conference, submit a CPM baseline schedule.

For each schedule, submit:

1. Plotted original, time-scaled network diagram on a sheet at least 8-1/2 by 11 inches with a title block and timeline
   2. A electronic copy in PDF (Adobe Acrobat compatible) format via email to the Engineer.

8-1.02B(2) Schedule Format

On each schedule, show:

1. Planned and actual start and completion dates of each work activity, including applicable:
   1.1. Submittal development
   1.2. Submittal review and acceptance
   1.3. Material procurement
   1.4. Contract milestones and constraints
   1.5. Equipment and plant setup
   1.6. Interfaces with outside entities
   1.7. Erection and removal of falsework and shoring
   1.8. Test periods
   1.9. Major traffic stage change
   1.10. Final cleanup
2. Order that you propose to prosecute the work

3. Logical links between the time-scaled work activities
4. All controlling activities
5. Legible description of each activity
6. At least 1 predecessor and 1 successor to each activity except for project start and project end milestones
7. Duration of at least 1 working day for each activity
8. Start milestone date as the Contract approval date

8-1.02B(3) Updated Schedule

Submit a monthly updated schedule that includes the status of work completed to date and the work yet to be performed as planned.

You may include changes to updated schedules that do not alter a critical path or extend the scheduled completion date compared to the current schedule. Changes may include:

1. Adding or deleting activities
2. Changing activity constraints
3. Changing durations
4. Changing logic

If any proposed change in planned work would alter the critical path or extend the scheduled completion date, submit a revised schedule within 15 days of the proposed change.

8-1.02C–8-1.02F Reserved

8-1.03 PRECONSTRUCTION CONFERENCE

Attend a preconstruction conference with key personnel, including your assigned representative, at a time and location determined by the Engineer. Submit documents as required before the preconstruction conference.

Be prepared to discuss the topics and documents shown in the following table:

Topic	Document
Potential claim and dispute resolution	Potential claim forms
Contractor's representation	Assignment of Contractor's representative
DBE	Final utilization reports
Equipment	Equipment list
Labor compliance and equal employment opportunity	Job site posters and benefit and payroll reports
Material inspection	Notice of Materials to be Used form
Materials on hand	Request for Payment for Materials on Hand form
Measurements	--
Partnering	--
Quality control	QC plans
Safety	Injury and Illness Prevention Program and job site posters
Schedule	Baseline schedule and Weekly Statement of Working Days form
Subcontracting	Subcontracting Request form
Surveying	Survey Request form
Traffic control	Traffic contingency plan and traffic control plans
Utility work	--
Weight limitations	--
Water pollution control	SWPPP or WPCP
Work restrictions	PLACs
Action submittals	--

8-1.04 START OF JOB SITE ACTIVITIES

8-1.04A General

Provide signed contracts, bonds, and evidence of insurance timely as required.

This section, 8-1.04, “Start of Job Activities,” does not modify remedies available to the Department should you fail to provide signed contracts bonds and insurance timely.

Submit a notice 72 hours before starting job site activities. If the project has more than 1 location of work, submit a separate notice for each location.

You may start job site activities before receiving notice of Contract approval if you:

1. Deliver the signed Contract, bonds, and evidence of insurance to the Department
2. Submit 72-hour notice
3. Are authorized by the Department to start
4. Perform work at your own risk
5. Perform work under the Contract

If the Contract is approved, work already performed that complies with the Contract is authorized.

If the Contract is not approved, leave the job site in a neat condition. If a facility has been changed, restore it to its former condition or an equivalent condition. The Department does not pay for the restoration.

8-1.04B Standard Start

Be prepared to begin work at the project site no later than May 1, 2024.

Working days shall commence to be counted on or before May 1, 2024. Working days shall commence to be counted on such day regardless of whether or not the Contractor has provided all required contract forms, bonds and insurance.

Start work on the day shown in the notice to proceed, unless an early start has been approved.

The Engineer will issue a notice of commencement of contract time if Contractor fails to provide Contracts, including bonds and insurance certificates or other required documents timely.

A notice of commencement of contract time does not authorize Contractor to start work on the project site, but contract time begins to elapse on the date shown in the notice of commencement of contract time.

Complete entire work before the expiration of

ONE HUNDRED (100) WORKING DAYS

from the date shown in said Notice to Proceed, or in the Notice of Commencement of Contract Time, whichever comes first.

Complete all work, including corrective work and punch list work, prior to the expiration of the allotted working days. Working days continue to accrue until corrective work and punch list work is completed and accepted.

Pay to the County of Fresno the sum of

THREE THOUSAND ($3,000.00)

per day for each and every calendar day's delay in finishing the work, including corrective work and punch list work, in excess of the total number of working days prescribed above.

The contractor will be allowed to start work on site while submittals are being reviewed with the exception of the following submittals. These submittals shall be approved before commencing work on site:

- Dust Control Plan by Engineer and conditional approval from SJVAPCD
- Traffic control plan (TCP)
- Water Pollution Control Plan (WPCP)
- Injury and Illness Prevention Plan (IIPP) and Health and Safety Plan (HASP)

Note: Dust Control Plan approval from SJVAPCD will take approximately 30 days. Contractor shall prepare and submit a DCP for review within 5 working days of the Board Award date for review and formal submittal to SJVAPCD to be ready to start work by May 1, 2024.

Modules Construction

Time is of essence to complete the Modules construction for regulatory approval purposes. The Contractor shall commence with the Module excavation and construction as depicted in plan sheets 4 through 10. Such work shall be completed within the following number of days, which runs concurrent with, and not in addition to, the number of working days for all work.

Complete Modules Construction before the expiration of

EIGHTY (80) WORKING DAYS

from the date shown in said Notice to Proceed or in the Notice of Commencement of Contract Time, whichever comes first.

Complete all work, including corrective work and punch list work, prior to the expiration of the allotted working days. Working days continue to accrue until corrective work and punch list work is completed and accepted.

Pay to the County of Fresno the sum of

FOUR THOUSAND ($4,000.00)

per day for each and every calendar day's delay in finishing this order of work, including corrective work and punch list work, in excess of the number of working days prescribed above.

The remainder of the tasks specified in the plans and specifications such as access roads, winter pad, electrical equipment, etc. can be completed in parallel with the Modules construction or after completion of the Module Construction phase; however, the entire project shall be completed within the time allotted for completion of the entire work.

Charges to the Contractor shall not exceed FOUR THOUSAND DOLLARS ($4,000.00) per calendar day should the contractor fail to finish the Module Construction phase and also exceed the number of working days for all work.

Under no circumstances shall charges exceed FOUR THOUSAND DOLLARS ($4,000.00) per calendar day for this project.

8-1.05 TIME

Contract time starts on the day specified in the notice to proceed or in the notice of commencement of contract time as described in section 8-1.04 or on the day you start job site activities, whichever occurs first.

Complete the work within the Contract time.

Meet each specified interim work completion date.

The Engineer issues a *Weekly Statement of Working Days* by the end of the following week.

The *Weekly Statement of Working Days* shows:

1. Working days and non–working days during the reporting week
2. Time adjustments
3. Work completion date computations, including working days remaining
4. Controlling activities

8-1.06 SUSPENSIONS

The Engineer may suspend work wholly or in part due to conditions unsuitable for work progress. Provide for public safety and a smooth and unobstructed passageway through the work zone during the suspension as specified in sections 7-1.03 and 7-1.04. Providing the passageway is force account work. The Department makes a time adjustment for the suspension due to a critical delay.

The Engineer may suspend work wholly or in part due to your failure to (1) fulfill the Engineer's orders, (2) fulfill a Contract part, or (3) perform weather-dependent work when conditions are favorable so that weather-related unsuitable conditions are avoided or do not occur. The Department may provide for a

weather-related unsuitable conditions are avoided or do not occur. The Department may provide for a smooth and unobstructed passageway through the work during the suspension and deduct the cost from payments. The Department does not make a time adjustment for the suspension.

Upon the Engineer's order of suspension, suspend work immediately. Resume work when ordered.

8-1.07 DELAYS

8-1.07A General

To request a delay-related time or payment adjustment, submit an RFI.

8-1.07B Time Adjustments

The Department may make a time adjustment for a critical delay. The Engineer uses information from the schedule to evaluate requests for time adjustments.

To request an adjustment, submit a revised schedule showing the delay's effect on the controlling activity. If the delay has:

1. Occurred, submit records of the dates and what work was performed during the delayed activity
2. Not occurred, submit the expected dates or duration of the delayed activity

Update the schedule to the last working day before the start of the delay if ordered.

8-1.07C Payment Adjustments

The Department may make a payment adjustment for an excusable delay that affects your costs.

Only losses for idle equipment, idle workers, and moving or transporting equipment are eligible for delay-related payment adjustments.

The Engineer determines payment for idle time of equipment in the same manner as determinations are made for equipment used in the performance of force account work under section 9-1.04 with the following exceptions:

1. Delay factor in the *Labor Surcharge and Equipment Rental Rates* applies to each equipment rental rate.
2. Daily number of payable hours equals the normal working hours during the delay, not to exceed 8 hours per day.
3. Delay days exclude non–working days.
4. Markups are not added.

The Engineer determines payment adjustment for the idle workers under section 9-1.04B, but does not add markups.

The Engineer includes costs due to necessary extra moving or transporting of equipment.

The Department does not make a payment adjustment for overhead incurred during non–working days of additional construction seasons experienced because of delay.

8-1.08–8-1.09 RESERVED

8-1.10 LIQUIDATED DAMAGES

8-1.10A General

The Department specifies liquidated damages (Pub Cont Code § 10226). Liquidated damages, if any, accrue starting on the 1st day after the expiration of the working days through the day of Contract acceptance except as specified in sections 8-1.10B and 8-1.10C.

The Department withholds liquidated damages before the accrual date if the anticipated liquidated damages may exceed the value of the remaining work.

Liquidated damages are specified in section 8-1.04.

8-1.10B Failure to Complete Work Parts within Specified Times

The Department may deduct specified damages from payments for each day needed to complete a work part in excess of the time specified for completing the work part.

Damages for untimely completion of work parts may not be equal to the daily amount specified as liquidated damages for the project as a whole, but the Department does not simultaneously assess damages for untimely completion of work parts and for the whole work.

Damages accrue starting the 1st day after a work part exceeds the specified time through the day the specified work part is complete.

8-1.10C Failure to Complete Work Parts by Specified Dates

The Department may deduct specified damages from payments for each day needed to complete a work part in excess of the specified completion date for the work part.

Damages for untimely completion of a work part may not be equal to the daily amount specified as liquidated damages for the project as a whole, but the Department does not simultaneously assess damages for untimely completion of a work part and the whole work.

Damages accrue starting the 1st day after an unmet completion date through the day the work part is complete.

8-1.10D RESERVED

8-1.11–8-1.12 RESERVED

8-1.13 CONTRACTOR'S CONTROL TERMINATION

The Department may terminate your control of the work for failure to do any of the following (Pub Cont Code § 10253):

1. Supply an adequate workforce
2. Supply material as described
3. Pay subcontractors (Pub Cont Code §10262)
4. Prosecute the work as described in the Contract

The Department may also terminate your control for failure to maintain insurance coverage.

For a federal-aid project, the Department may terminate your control of the work for failure to include "Required Contract Provisions, Federal-Aid Construction Contracts" in subcontracts.

The Department gives notice to you and your surety at least 5 business days before terminating control. The notice describes the failures and the time allowed to remedy the failures. If failures are not remedied within the time provided, the Department takes control of the work.

The Department may complete the work if the Department terminates the Contractor's control or you abandon the project (Pub Cont Code § 10255). The Department determines the unpaid balance under Pub Cont Code § 10258 and the Contract.

At any time before final payment of all claims, the Department may convert a Contractor's control termination to a Contract termination.

8-1.14 CONTRACT TERMINATION

8-1.14A General

The Director may terminate the Contract if it serves the State's best interest. The Department issues you a written notice, implements the termination, and pays you.

8-1.14B Relief from Responsibility for Work

Upon receiving a termination notice:

1. Stop work
2. Notify subcontractors and suppliers of the Contract termination and stop Contract-related work
3. Perform the Engineer-ordered work to secure the job site for termination
4. Remove equipment
5. Subject to the Engineer's authorization, settle termination-related claims and liabilities involving subcontractors and suppliers; assign to the Department the rights, titles, or interests held by you with respect to these parties

8-1.14C Responsibility for Materials

Upon receiving a termination notice, protect unused material until:

1. You submit an inventory of materials already produced, purchased, or ordered but not yet used; include the location of the material.
2. The Engineer identifies materials that will be retained by the Department. Submit bills of sales or other records of material title.
3. The Engineer confirms that unused materials paid by progress payment and materials furnished by the State have been delivered and stored as ordered.
4. The titles are transferred for materials purchased by the Department.

Dispose of materials that will not be retained by the Department.

8-1.14D Contract Acceptance after Termination

The Engineer recommends Contract acceptance after determining the completion of:

1. Work ordered to be completed before termination
2. Other work ordered to secure the project before termination
3. Material delivery and title transfer

The Department pays you under section 9-1.17.

8-1.14E Payment Adjustment for Termination

If the Department issues a termination notice, the Engineer determines the payment for termination based on the following:

1. Direct cost for the work:
    - 1.1. Including:
        - 1.1.1. Mobilization.
        - 1.1.2. Demobilization.
        - 1.1.3. Securing the job site for termination.
        - 1.1.4. Losses from the sale of materials.
    - 1.2. Not including:
        - 1.2.1. Cost of materials you keep.
        - 1.2.2. Profit realized from the sale of materials.
        - 1.2.3. Cost of material damaged by:
            - 1.2.3.1. Act of God.
            - 1.2.3.2. Act of a public enemy.
            - 1.2.3.3. Fire.
            - 1.2.3.4. Flood.
            - 1.2.3.5. Governor-declared state of emergency.
            - 1.2.3.6. Landslide.
            - 1.2.3.7. Tsunami.
        - 1.2.4. Other credits.
2. Cost of remedial work, as estimated by the Engineer, is not reimbursed.
3. Allowance for profit not to exceed 4 percent of the cost of the work. Prove a likelihood of having made a profit had the Contract not been terminated.
4. Material handling costs for material returned to the vendor or disposed of as ordered.
5. Costs in determining the payment adjustment due to the termination, excluding attorney fees and litigation costs.

Termination of the Contract does not relieve the surety of its obligation for any just claims arising out of the work performed.

8-1.15–8-1.16 RESERVED

9 PAYMENT

Add Section 9-1.01A:

9-1.01A BID ITEM EXPLANATION

GENERAL

The Contract payment for the specified items of work as set forth in the Bid Schedule shall be full compensation for furnishing all labor, materials, methods or processes, implements, tools, equipment and incidentals and for doing all work involved as required by the provisions of the Contract Documents for a complete in place and operational system.

Unless otherwise specified in the Specifications, quantities of work shall be determined per each, or from measurements or dimensions in a horizontal plane. All materials shall be measured on the basis of "in place" quantities and paid for using the units listed in the bid schedule.

Except as noted, the Engineer will make field measurements of unit price items in order to determine the quantities of the various items as a basis for payment. On all unit price items, the contractor will be paid for the actual amount of the work performed in accordance with the contract documents, as computed from field measurements.

The bid items shown in the bid item list represent full compensation for performing all work. Full compensation for any work for which there is no bid item shall be considered to be included in the various items of work. Work or quantities not listed in the description of bid items are considered incidental to other construction and will not be separately measured or paid for. Compensation for such work and/or material shall be included in the prices paid for other items of work.

Contractor shall provide a Schedule of Values for all lump sum items to support the lump sum price.

REJECTED MATERIALS

Quantities of material wasted or disposed in a manner not called for in the Specifications; rejected loads of material, including material rejected after it has been placed by reasons of the failure of Contractor to conform to the provisions of the Specifications; material not unloaded from the transporting vehicle; material placed outside the limits indicated by the Construction Drawings or established by County; or material remaining on hand after completion of the Work, will not be paid for, and such quantities will not be included in the final total quantities. No compensation will be made for loading, hauling, and disposing of rejected material.

Bid Item No. 1 - SUPPLEMENTAL WORK ALLOWANCE

This item is provided to account for supplemental work for unforeseen work which the Engineer determines is necessary to allow for the work required by the Contract Documents to proceed as intended without interruption. This item will be used only for this purpose. The dollar amount listed on the Bid Proposal Form is an estimated allowance set aside by the County and shall be included on each Bidder's Bid Proposal sheets.

Supplemental work shall be performed only upon direct written authorization from the Engineer and daily extra work reports shall be submitted to and approved by the Engineer. The Contractor shall maintain separate records for extra work performed in accordance with the provisions of Section 5-1.27, "Records," of the Standard Specifications and the special provisions.

The Contractor will be paid only for the value of completed supplemental work which has been authorized in writing by the County.

The value of work, which the Owner may authorize under this item, may be less than the amount shown on the Bid Proposal sheet, and it could be that no supplemental work will be authorized at all. Accordingly, payments to the Contractor for supplemental work will likely differ substantially from the estimated Allowance which is included in the Bid Proposal.

If no supplemental work is authorized or if no authorized supplemental work is performed, then no payments will be made to the Contractor under this Bid item and the Contract Price will be reduced by the full amount of the item included in the Bid Proposal for supplemental work. The provisions in Section

9-1.06, “Changed Quantity Pay Adjustments” of the Standard Specifications shall not apply to the item “Supplemental Work Allowance.”

The Contractor shall have no claim for anticipated overhead or profit should the County fail to authorize any supplemental work or should the value of authorized supplemental work be less than anticipated by the Contractor.

Bid Item No. 2 - SUPPLEMENTAL WORK (SPECIAL STOCKPILING) –

It is anticipated that the area designated in the plans (Stockpile Area) for stockpiling material from the excavation of Modules 9 and 10 will be able to contain all material specified to be placed therein. In the event that unforeseen circumstances not caused by the Contractor require the Contractor to use an alternative location for a portion of the permanent stockpiling operation, this item will be used to compensate the Contractor therefor. Compensation for this item, if any, will be limited to the difference between the Contractor’s cost to utilize Permanent Stockpile Areas to stockpile the amount of material that cannot be accommodated by said stockpile area and the Contractor’s cost to perform such Special Stockpiling, as demonstrated by the Contractor to the satisfaction of the Engineer.

In the event that the need to perform Special Stockpiling is precipitated by the Contractor’s failure to place material in Permanent Stockpile Area in accordance with the requirements pertaining thereto elsewhere in these Special Provisions, or is otherwise caused by the Contractor’s failure to perform the work in accordance with all requirements pertaining to the Project, Special Stockpiling shall be performed at the Contractor’s expense and no additional compensation will be allowed therefor.

If no supplemental work is authorized or if no authorized supplemental work is performed, then no payments will be made to the Contractor under this Bid item and the Contract Price will be reduced by the full amount of the item included in the Bid Proposal for supplemental work. The provisions in Section 9-1.06, “Changed Quantity Pay Adjustments” of the Standard Specifications shall not apply to the item “Supplemental Work Allowance.”

The Contractor shall have no claim for anticipated overhead or profit should the County fail to authorize any supplemental work or should the value of authorized supplemental work be less than anticipated by the Contractor.

Bid Item No. 3 - SUPPLEMENTAL WORK (SPECIAL TRAFFIC HANDLING AND OPERATIONS)

Public landfill traffic, including commercial waste haulers, will utilize the landfill entrance road and scale house on a continuous basis in large numbers; however, it is anticipated that the vast majority of waste delivered will be placed in the existing Phase III fill area. If such circumstances have a substantial and quantifiable adverse impact on the Contractor’s operations and/or require additional traffic control which would not otherwise be required, this item will be used to compensate the Contractor therefor.

Compensation for this item, if any, will be limited to the difference between the Contractor’s cost to perform the work absent such adverse impact and the Contractor’s cost to perform the work under the changed adverse conditions.

If no supplemental work is authorized or if no authorized supplemental work is performed, then no payments will be made to the Contractor under this Bid item and the Contract Price will be reduced by the full amount of the item included in the Bid Proposal for supplemental work. The provisions in Section 9-1.06, “Changed Quantity Pay Adjustments” of the Standard Specifications shall not apply to the item “Supplemental Work Allowance.”

The Contractor shall have no claim for anticipated overhead or profit should the County fail to authorize any supplemental work or should the value of authorized supplemental work be less than anticipated by the Contractor.

Bid Item No. 4 – JOB SITE MANAGEMENT.

This bid item is a lump sum bid item for the cost of all work involved with job site management and

includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in spill prevention and control, material management, preparation and implementation of a dust control plan per section 14 of the specifications, including fees by the SJVAPCD, , waste management, non-stormwater management, and dewatering and identifying, sampling, testing, handling, and disposing of hazardous waste resulting from your activities, as specified in the Standard Specifications and these Special Provisions, and as ordered by the Engineer.

This item is intended to cover all of the base "Job Site Management" costs for the entire project.

This item also includes providing worker protection from trench failures and other hazards that may occur during construction. The Contractor shall comply with the provisions of the Construction Safety Orders, Tunnel Safety Orders, and General Safety Orders issued by the State of California Division of Industrial Safety, as well as all other applicable laws, ordinances and regulations, as they pertain to the protection of workers from the hazard of caving ground.

The Contractor shall obtain a permit from the Division of Industrial Safety of the State of California prior to commencement of construction. This bid item shall be paid at the lump sum price bid.

Bid Item No. 5 – PREPARE AND IMPLEMENT STORM WATER POLLUTION PREVENTION PLAN

This bid item is a lump sum bid item for the cost of all work involved for labor, materials, equipment, tools, and incidentals required to develop and implement a Stormwater Pollution Prevention Plan (SWPPP) consistent with the requirements of these Special Provisions and Section 13 of the Caltrans Standard Specifications. Payment also includes all costs for providing labor and materials to install geosynthetic liner for the low point in the roadside ditch by STA 25 of the Construction Drawings. Payment for this bid item shall also include all costs for maintaining all stormwater management best management practices (BMPs) until completed work has been accepted by the Engineer.

Bid Item No. 6 – HEALTH AND SAFETY.

This bid item is a lump sum bid item for the cost of all work involved with job site management and includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in preparing and implementing an Injury and Illness Prevention Plan (IIPP) and Health and Safety Plan (HASP) per Section 7 of the Specifications, respond to Engineer comments on the plan, providing appropriate personal protective equipment and any other necessary safety equipment, and for providing safety training to all Contractor and Subcontractor personnel associated with the project. Contractor shall provide a Schedule of Values for this service to support the lump sum price.

Bid Item No. 7 – CONSTRUCTION SURVEY.

This bid item is a lump sum bid item for the cost of all work involved for labor, materials and equipment to perform construction control and slope staking, surveys to complete quantities, surveys to document as-built conditions of the Construction, and the preparation of as-built Drawings as described in the Specifications. Contractor shall provide a Schedule of Values for this service to support the lump sum price.

Bid Item No. 8 - TRAFFIC CONTROL

This bid item is a lump sum bid for all materials, labor and appurtenances required to maintain traffic control measures within the project limits in accordance with the Standard Specifications and Special Provisions and as directed by the Engineer.

The California Manual on Uniform Traffic Control Devices (MUTCD), latest edition, is hereby referred to and incorporated herein as though set forth in full. The Contractor shall be responsible for providing

all necessary traffic control facilities, 24 hours per day, 7 days per week for the entire duration of the project.

The Contractor shall strictly comply with, and will be solely responsible for, all required traffic control and devices as per approved plan and any revisions thereof.

The Contractor shall provide safe access for the County, County's representatives inspection staff.

Full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved for the sole convenience, direction and safety of traffic shall be included in this bid item. This bid item shall be paid at the lump sum price bid. Contractor shall provide a Schedule of Values for this service to support the lump sum price.

Bid Item No. 9 – CLEARING AND GRUBBING

This bid item is a lump sum bid for the cost of all work involved in clearing and grubbing all project sites. This bid item is intended to cover all of the "Clearing and Grubbing" costs for the entire project.

Clear and grub vegetation only within the immediate limits required for the installations of the contract facilities. Said areas shall be stripped of surface vegetation, including clearing and grubbing of all shrubs, bushes, vines, stumps, roots, debris and unsuitable material, within the project site area per Standard Specifications and these Specifications during construction and related work. This bid item shall be paid at the lump sum price bid.

The bid item price shall include full compensation for furnishing all labor, tools, equipment, and materials, along with all associated appurtenances required to complete the work under this bid item, in conformance with the plans and specifications, and as directed by the Engineer. This bid item shall be paid at the lump sum price bid. Payment will be prorated based on the percentage of contract work completed.

Bid Item No. 10 – UNSUITABLE MATERIAL

The contract unit price paid per square yard for unsuitable material shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in excavating hauling, and depositing unsuitable material and loading, hauling placing, and compacting suitable material from the excavation to replace removed unsuitable material as shown on the Plans, as specified in these Special Provisions and the Standard Specifications and as directed by the Engineer.

The quantity of unsuitable material to be paid for shall be the actual cubic yard quantity as calculated based on the lines as determined by the Engineer. No compensation will be allowed for quantities of unsuitable material in excess of that allowed by the Engineer.

The exact quantity of unsuitable material which may be encountered is unknown. For bidding purposes, a quantity has been estimated for unsuitable material. No adjustment of contract unit price will be made for any increase or decrease in the quantity of unsuitable material regardless of the reason for such increase or decrease. The provisions in Section 9-1.06, "Changed Quantity Payment Adjustments," of the Standard Specifications shall not apply to the unsuitable material item.

The Contractor shall have no claim for anticipated overhead or profit should the County fail to authorize any supplemental work or should the value of authorized supplemental work be less than anticipated by the Contractor.

Bid Item No. 11 – MODULE EXCAVATION

Full compensation for providing all labor, material, equipment and incidentals and for doing all the work involved in constructing module excavation and embankment to achieve the grades within the area delineated as "Modules 9 and 10 daylight limits" shown in plans; and to achieve 90% minimum compaction beyond the GCL limit as required in section 19-4.01 C as shown on the Plans, specified in these Special Provisions and as directed by the Engineer shall be included in the unit price per cubic yard for Module Excavation and no additional compensation will be allowed therefor. The quantity depicted in this Bid Item is the amount of cut necessary within Module 9 and 10 excavation limits to achieve the specified grades from original ground. Any embankment work within the limits of Module 9 and 10 (approximately 10,000 CY) shall be considered as part of this bid item and no further compensation will be allowed therefor. The quantity of Module Excavation is a final pay quantity.

The contract unit price paid per cubic yard for module excavation shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in excavating, the sump area and the leachate collection drain and pan lysimeter trench along with the remainder of Modules 9 & 10, including loading, hauling, and depositing the excavation, as shown on the Plans, as specified in these Special Provisions and the Standard Specifications and as directed by the Engineer.

Bid Item No. 12 – MODULE 9 & 10 SUBGRADE PREPARATION

Full compensation for providing all labor, material, equipment and incidentals and for doing all the work involved in subgrade preparation within the area delineated as "Modules 9 and 10 subgrade limits" as shown on the Plans, as specified in these Special Provisions and as directed by the Engineer, shall be included in the unit price per square yard for Subgrade Preparation, and no additional compensation will be allowed therefor. The quantity of Module 9 & 10 Subgrade preparation is a final pay quantity.

Bid Item No. 13 – FINISH PROJECT SITE

The contract lump sum price paid "Finish project site" includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in implementing necessary activities and measures as specified in the Standard Specifications Section 22 and these special provisions, and as ordered by the Engineer

Bid Item No. 14 – PERFORATED HDPE PIPE 6"

The contract unit price paid per linear foot for 6-inch Perforated HDPE Pipe shall include full compensation for furnishing all labor, materials, fittings, caps, tools, equipment and incidentals, and for doing all the work involved in transporting, storing, placing, joining and bedding the perforated leachate collection pipe, doing the work involved in installing the stainless steel pull ropes as shown on the plans, doing all the work involved in installing nylon pull ropes as shown on the plans and doing all the work involved in television inspection and preparing the video tapes, as specified in these Special Provisions and as directed by the Engineer. If a pipe is cut to fit in a specific area the payment quantity is the length of pipe installed and measured along the centerline only.

Bid Item No. 15 – PERFORATED HDPE PIPE 10"

The contract unit price paid per linear foot for 10-inch Perforated HDPE Pipe shall include full compensation for furnishing all labor, materials, fittings, caps, tools, equipment and incidentals, and for doing all the work involved in transporting, storing, placing, joining and bedding the perforated leachate collection pipe, doing the work involved in installing the stainless steel pull ropes as shown on the plans, and doing all the work involved in television inspection and preparing the video tapes, as specified in these Special Provisions and as directed by the Engineer. If a pipe is cut to fit in a specific area the payment quantity is the length of pipe installed and measured along the centerline only.

Bid Item No. 16 – NON-PERFORATED HDPE PIPE 6"

The contract unit price paid per linear foot for 6-inch plain HDPE Pipe shall include full compensation for furnishing all labor, materials, fittings, caps, tools, equipment and incidentals, and for doing all the work involved in transporting, storing, placing, joining and bedding the perforated leachate collection

pipe, doing the work involved in installing the stainless steel pull ropes as shown on the plans, doing all the work involved in installing nylon pull ropes as shown on the plans and doing all the work involved in television inspection and preparing the video tapes, as specified in these Special Provisions and as directed by the Engineer. If a pipe is cut to fit in a specific area the payment quantity is the length of pipe installed and measured along the centerline only.

Bid Item No. 17 – NON-PERFORATED HDPE PIPE 10"

The contract unit price paid per linear foot for 10-inch plain HDPE Pipe shall include full compensation for furnishing all labor, materials, fittings, caps, tools, equipment and incidentals, and for doing all the work involved in transporting, storing, placing, joining and bedding the perforated leachate collection pipe, doing the work involved in installing the stainless steel pull ropes as shown on the plans, as specified in these Special Provisions and as directed by the Engineer. If a pipe is cut to fit in a specific area the payment quantity is the length of pipe installed and measured along the centerline only.

Bid Item No. 18 – GEOSYNTHETIC CLAY LINER

A. The quantity of GCL will be calculated by measurements made along the plane of installation and shall include GCL installed in the anchor trenches to the dimensions shown on the Plans.

B. GCL required for seam overlap and GCL required to repair or replace damaged material will not be measured.

A. The quantity of GCL is a final pay quantity. Payment for furnishing and installing GCL will be by the unit price per square foot quoted therefor in Bid Schedule.

B. The contract unit price paid per square foot for GCL shall include full compensation for furnishing all labor, materials, equipment, accessories, and incidentals, and for performing all work specified including, but not limited to: quality control testing of material prior to delivery; installing; seaming; testing; repairing; providing, placing and removing sandbags; anchor trench excavation and backfill; and providing all Contractor CQA documentation required to complete the work in accordance with these Special Provisions, the Plans, and as directed by the Engineer.

C. GCL required for seam overlap and GCL required to repair or replace damaged material will not be paid for. All costs in connection therewith shall be considered to be included in the various items of work and no additional compensation will be made therefor.

Bid Item No. 19 – HDPE GEOMEMBRANE

A. The quantity of Geomembrane will be calculated by measurements made along the plane of installation and shall include Geomembrane installed in the anchor trenches to the dimensions shown on the Plans.

B. Geomembrane required for seam overlap, rub sheet and Geomembrane required to repair or replace damaged material will not be measured.

C. The quantity of Geomembrane is a final pay quantity. Payment for furnishing and installing Geomembrane will be by the unit price per square foot quoted therefor in Bid Schedule.

D. The contract unit price paid per square foot for Geomembrane shall include full compensation for furnishing all labor, materials, equipment, accessories, and incidentals, and for performing all work specified including, but not limited to: quality control testing of material prior to delivery; installing; seaming; testing; repairing; providing, placing and removing sandbags; and repairing any defects in the liner system identified by the leak location survey thereby; and providing all Contractor Geomembrane documentation required to complete the work in accordance with the Plans, these Special Provisions, and as directed by the Engineer.

E. Geomembrane required for seam overlap and Geomembrane required to repair or replace damaged material will not be paid for. All costs in connection therewith shall be considered to be included in the various items of work and no additional compensation will be made therefor.

F. For each laboratory destructive test failure in excess of 5 percent of the total number of destructive weld tests performed by the CQA Consultant, the Owner will deduct $1,000 from final payment to the Contractor.

Bid Item No. 20 – GEOCOMPOSITE

A. The quantity of Geocomposite will be calculated by measurements made along the plane of installation and shall include Geocomposite installed in the anchor trenches to the dimensions shown on the Plans.

B. Geocomposite required for seam overlap and Geocomposite required to repair or replace damaged material will not be measured.

C. The quantity of Geocomposite is a final pay quantity. Payment for furnishing and installing Geocomposite will be by the unit price per square foot quoted therefor in Bid Schedule.

D. The contract unit price paid per square foot for Geocomposite shall include full compensation for furnishing all labor, materials, equipment, accessories, and incidentals, and for performing all work specified including, but not limited to: quality control testing of material prior to delivery; installing; seaming; testing; repairing; providing, placing and removing sandbags; anchor trench excavation and backfill; and providing all Contractor CQA documentation required to complete the work in accordance with these Special Provisions, the Plans, and as directed by the Engineer.

E. Geocomposite required for seam overlap and Geocomposite required to repair or replace damaged material will not be paid for. All costs in connection therewith shall be considered to be included in the various items of work and no additional compensation will be made therefor.

Bid Item No. 21 – GEOTEXTILE (10 OZ)

A. The quantity of Geotextile will be calculated by measurements made along the plane of installation and shall include Geotextile installed in the sump pump to the dimensions shown on the Plans.

B. Geotextile required for seam overlap and Geotextile required to repair or replace damaged material will not be measured.

C. Geotextile fabric required to wrap gravel fill for leachate pipe collection trenches will not be measured.

D. Geotextile fabric used as cushion for the side slope HDPE Geomembrane and for ultraviolet light protection will not be measured.

E. The quantity of Geotextile is a final pay quantity. Payment for furnishing and installing Geotextile will be by the unit price per square foot quoted therefor in Bid Schedule.

F. The contract unit price paid per square foot for Geotextile shall include full compensation for furnishing all labor, materials, equipment, accessories, and incidentals, and for performing all work specified including, but not limited to: quality control testing of material prior to delivery; installing; seaming; testing; repairing; providing, placing and removing sandbags; and providing all Contractor CQA documentation required to complete the work in accordance with these Special Provisions, the Plans, and as directed by the Engineer.

G. Geotextile required for seam overlap and Geotextile required to repair or replace damaged material will not be paid for. All costs in connection therewith shall be considered to be included in the various items of work and no additional compensation will be made therefor.

H. Geotextile fabric used as cushion for the side slope HDPE Geomembrane and for ultraviolet light protection will not be paid for. All costs in connection therewith shall be considered to be included in the various items of work and no additional compensation will be made therefor.

Bid Item No. 22 – PROTECTIVE PLYWOOD COVER

The quantity of protective plywood cover shall be measured by the 4 ft. x 8 ft. sheet, complete in place as shown in Section 100-6.03, "Placement", of these Special Provisions.

The contract price paid per sheet for protective plywood cover shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in furnishing, installing, removing and disposing of the protective plywood cover as shown on the Plans, as specified in these Special Provisions and as directed by the Engineer.

Bid Item No. 23 – OPERATIONS LAYER

The contract unit price paid per cubic yard for Operations Layer shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in excavating, transporting, installing, and compacting the Operations Layer, and repairing any defects in the liner system identified by the leak location survey thereby, as shown on the Plans, as specified in these Special Provisions and as directed by the Engineer and no additional compensation will be provided therefor. The quantity of Operations Layer is a final pay quantity

Bid Item No. 24 – LEACHATE & LYSIMETER METER, METERING PIPE & FITTINGS

The contract price paid for lump sum for leachate meter, metering pipe & fittings shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in providing and installing, PVC pipe and fittings, valves, adaptors, in-line mag flow transmitter, pipe supports to the leachate assembly as shown on the Plans, as specified in these Special Provisions and the Standard Specifications and as directed by the Engineer.

Bid Item No. 25 – LEACHATE AND LYSIMETER PUMPS

The contract price paid for lump sum for leachate sump pumps shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in providing and installing the leachate and lysimeter pumps and associated appurtenances as shown on the Plans, as specified in these Special Provisions and the Standard Specifications and as directed by the Engineer. The compensation shall also include facility startup, testing, and demonstration for the leachate pump systems.

Bid Item No. 26 – STEEL PIPE BOLLARD

The contract unit price paid for each Steel Pipe Bollard shall include full compensation for furnishing all labor, materials, equipment and incidentals, and for doing all work involved in providing and installing bollards complete in place, including concrete footings, fill in with concrete, cleaning, blasting, coating, and reflective bands as shown on the Plans, as specified in these Section 99 of the Special Provisions and the Standard Specifications, and as directed by the Engineer, and no additional compensation will be allowed therefor.

Bid Item No. 27 – CLASS 3 CONCRETE (SLAB)

The contract unit price paid per cubic yard for Concrete Slab shall include full compensation for furnishing all labor, materials, equipment and incidentals, and for doing all work involved in installing concrete slabs complete in place, and excavation and backfill, as shown on the Plans, as specified in these Special Provisions and the Standard Specifications, and as directed by the Engineer, and no additional compensation will be allowed therefor. The quantity of Class 3 Concrete (Slab) is a final pay

quantity.

Bid Item No. 28 – FURNISH AND INSTALL SUMP CONTROL PANEL, PANEL BACKBOARD AND HARDWARE

The contract price paid for lump sum for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing, installing and erecting panels, foundation, plywood backboards, strut supports, other appurtenances for the control panel, channels and necessary hardware as shown on the Plans, and as specified in the Standard Specifications and the Special Provisions, and as directed by the Engineer. The compensation shall include all work but is not limited to, enclosures, control panels, programmable logic controllers, central processing units, radio modems, displays, wiring, masts and antennas, breakout boxes, grounding wires and appurtenances as shown on the Plans, as specified in these Special Provisions and the Standard Specifications and as directed by the Engineer. This bid item also includes, but is not limited to, wiring, electrical and communication, conductors, connections to proposed leachate metering manifolds, connection to the riser pipes, connections to existing power supply, trenching and backfill, and appurtenances, start-up testing, and commissioning.

Bid Item No. 29 – PERMEABLE MATERIAL

The quantity of permeable material shall be measured and paid for by the cubic yard of permeable material complete in place as calculated from lines and grades shown on the Plans.

The contract unit price paid per cubic yard for permeable material shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in installing the permeable material, including testing, removing and disposing of water, and maintaining the permeable material for the duration of the project, as shown on the Plans and as specified in these Special Provisions and as directed by the Engineer.

The quantity of permeable material is a final pay quantity. Payment for furnishing and installing permeable material will be by the unit price per cubic yard quoted therefor in Bid Schedule.

Bid Item No. 30 – GEOELECTRIC LEAK LOCATION SURVEY SUPPORT

The contract lump sum price paid for Geoelectric Leak Location support shall include full compensation for furnishing all labor, materials (including the necessary uninsulated solid copper wire), tools, equipment and incidentals, and for doing all the work involved in performing the work for the Geoelectric Leak Location support as referenced in Section 100-2.03.6 and Section 100-7 of these Special Provisions and as directed by the Engineer.

Bid Item No. 31 – CUSTOMER ACCESS & SCRAPER ACCESS ROADS EMBANKMENT

Full compensation for providing all labor, material, equipment and incidentals and for doing all the embankment construction work involved to achieve the grades as shown on the Plans, including loading, hauling, and bringing soil, moisture conditioning, compacting as specified in the plans, these Special Provisions, Standard Specifications and as directed by the Engineer shall be included in the unit price per cubic yard and no additional compensation will be allowed therefor.

This bid item shall include all embankment work along the access road from STA 10 to STA 34+74, including the two scrappers access roads to the stockpile area shown in the plans. The volume is measured from original ground or Module 9 & 10 top of operations layer as shown in typical sections in Sheet #12 & #13 of construction drawings shown as “new infill 90% CNS” .

Any volume of embankment disposed by the aggregate base is not measured as embankment work but shall be included in this bid item cost. Any temporary embankment the contractor may build as a result of work being executed, will not be measured as part of embankment construction but shall be included in this bid item cost.

The quantity of customer access & scraper access roads embankment is a final pay quantity. Payment for furnishing and installing material will be by the unit price per cubic yard quoted therefor in Bid

Schedule.

Bid Item No. 32 – CUSTOMER ACCESS & SCRAPER ACCESS ROAD EXCAVATION

Full compensation for providing all labor, tools, material, equipment and incidentals and for doing all the excavation work involved to achieve the grades as shown on the Plans, scarifying compacting, hauling, placing it or stockpiling the material at the specified location, specified in the plans, these Special Provisions, Standard Specifications as directed by the Engineer shall be included in the unit price per cubic yard and no additional compensation will be allowed therefor.

This bid item shall include all excavation work along the access road from STA 10 to STA 26+80, including ditches, the maintenance pad and the two scrappers access roads to the stockpile area beyond the grades excavated under Module 9 and 10 excavation bid item.

Any volume of soil excavated within the embankment areas for the purpose of placing aggregate base is not measured as road excavation work but shall be included in this bid item cost. Any temporary excavation the contractor may perform as a result of work being executed, will not be measured as part of excavation construction but shall be included in this bid item cost.

The quantity of customer access & scraper access roads excavation is a final pay quantity. Payment for excavating material will be by the unit price per cubic yard quoted therefor in Bid Schedule.

Bid Item No. 33 – WINTER PAD EMBANKMENT

Full compensation for providing all labor, material, equipment and incidentals and for doing all the embankment construction work involved to achieve the grades as shown on the Plans for the winter pad, including loading, hauling, and bringing soil, moisture conditioning, compacting as specified in the plans, these Special Provisions, Standard Specifications and as directed by the Engineer shall be included in the unit price per cubic yard and no additional compensation will be allowed therefor.

This bid item shall include all embankment work to construct the winter pad within the limit shown in the plans. The volume is measured from Modules 9 & 10 top of operation layer as shown in typical sections in Sheet #13 of construction drawings shown as “new infill 90% CNS”.

Any temporary embankment the contractor may build as a result of work being executed, to protect operations layer, etc will not be measured as part of embankment construction but shall be included in this bid item cost.

The quantity of winter pad is a final pay quantity. Payment for furnishing and installing material will be by the unit price per cubic yard quoted therefor in Bid Schedule.

Bid Item No. 34 – CLASS 2 AGGREGATE BASE

Full compensation for providing all labor, surveying, material, tools, transport, moisture condition, compact with smooth drum roller, grade finish surface, necessary to install aggregate base along the access roads and winter pad as shown on the Construction Drawings, per Section 26 of the Standard Specifications and as directed by the Engineer shall be included in the unit price per cubic yard and no additional compensation will be allowed therefor.

The quantity of aggregate base is a final pay quantity. Payment for furnishing and installing aggregate base will be by the unit price per cubic yard quoted therefor in Bid Schedule.

Bid Item No. 35 – INSTALLATION OF 12" DIA. HDPE CULVERT

Measurement by the Linear Foot (LF) of HDPE culvert installed. Measurement shall be made by the surveyed length along the centerline of the installed culvert. When pipes are side by side in the same trench the measurement being paid is length of each pipe

Payment shall be by the Linear Foot (LF). Payment shall include full compensation for providing all labor, tools, and incidentals required to excavate the pipe trench, install pipe bedding, supply and install pipe zone and trench backfill, installing the County furnished pipe as shown in the Construction Drawings, as well as backfilling and compaction of the backfill and performing all work as shown in the Construction Drawings and as described in the Specifications. County will furnish 12" HPDE DR 17 in 40-foot segments. Contractor is responsible for cutting and welding the section of pipe as necessary to fit the job being completed

Bid Item No. 36 – TRAFFIC SIGN

The contract unit price paid for each sign installed shall include full compensation for furnishing all labor, materials, equipment and incidentals, and for doing all work involved in providing and installing sign complete in place, including concrete footings, as shown on the Plans, as specified in these Special Provisions and the Standard Specifications, and as directed by the Engineer, and no additional compensation will be allowed therefor.

Bid Item No. 37 – CLASS I FLEXIBLE POST DELINEATORS - TYPE E

The contract unit price paid for each delineator installed shall include full compensation for furnishing all labor, materials, equipment and incidentals, and for doing all work involved in providing and installing delineator complete in place, per manufacturer directions, as shown on the Plans, as specified in these Special Provisions and Section 81-2 of the Standard Specifications, and as directed by the Engineer, and no additional compensation will be allowed therefor.

Bid Item No. 38 – 8" DIAMETER STRAW WATTLES

The contract unit price paid for lineal foot installed shall include full compensation for furnishing all labor, materials, equipment and incidentals, and for doing all work involved in providing and installing straw wattles complete in place, per manufacturer directions, as shown on the Plans, as specified in these Special Provisions and Section 21 of the Standard Specifications, and as directed by the Engineer, and no additional compensation will be allowed therefor.

Measurement of erosion control measures will be made by the surveyed centerline length of installed straw wattles. No adjustments will be made for uneven contours, for overlaps, seams, wastage, or for material that was damaged from either the fault or negligence of the Contractor.

Bid Item No. 39 – 20" DIAMETER STRAW WATTLES

The contract unit price paid for lineal foot installed shall include full compensation for furnishing all labor, materials, equipment and incidentals, and for doing all work involved in providing and installing straw wattles complete in place, per manufacturer directions, as shown on the Plans, as specified in these Special Provisions and Section 21 of the Standard Specifications, and as directed by the Engineer, and no additional compensation will be allowed therefor.

Measurement of erosion control measures will be made by the surveyed centerline length of installed straw wattles. No adjustments will be made for uneven contours, for overlaps, seams, wastage, or for material that was damaged from either the fault or negligence of the Contractor.

Bid Item No. 40 - MOBILIZATION

This item is a lump sum bid for mobilization, all necessary bonds, insurance, permits, licenses required during the performance of the work, and demobilization and shall conform to the provisions of these Specifications. This bid item is intended to cover all of the base "Mobilization" costs for the entire project.

This item shall consist of covering the Contractors cost for Contract Documents and for the moving of personnel, equipment, supplies and incidentals to the different project sites. This item includes any construction staking that is not provided by the Owner. This item also includes demobilization, including removal of all equipment supplies, personnel, and incidentals from the project sites at the end of construction.

All costs associated with this item shall be included in the lump sum price and no additional payment will be made. This bid item shall be paid as specified in Section 9 Payment and Sub- Section 9-1.16 D Mobilization of the State Standard Specifications.

Replace Section 9-1.03 with:

9-1.03 PAYMENT SCOPE

The Department pays you for furnishing the resources and activities required to complete the work. The Department's payment is full compensation for furnishing the resources and activities, including:

1. Risk, loss, damage repair, or cost of whatever character arising from or relating to the work and performance of the work
2. PLACs and taxes
3. Any royalties and costs arising from patents, trademarks, and copyrights involved in the work

The Department does not pay for your loss, damage, repair, or extra costs of whatever character arising from or relating to the work that is a direct or indirect result of your choice of construction methods, materials, equipment, or manpower, unless specifically mandated by the Contract.

Payment is:

1. Full compensation for all work involved in each bid item shown on the Bid Item List by the unit of measure shown for that bid item
2. For the price bid for each bid item shown on the Bid Item List or as changed by change order with a specified price adjustment

Full compensation for work specified in divisions I, II, and X is included in the payment for the bid items unless:

1. Bid item for the work is shown on the Bid Item List
2. Work is specified as change order work

Work paid for under one bid item is not paid for under any other bid item.

Payment for a bid item includes payment for work in sections referenced by the section set forth by that bid item.

Notwithstanding anything to the contrary in these special provisions, full compensation for performing all work as shown, as specified, and as directed by the Engineer is considered to be included in the various bid items, and no additional payment will be made, except pursuant to a contract change order to perform work not shown and/or specified.

If one or more bid item(s) is/are not included, perform the work as shown and as specified and payment therefor is considered to be included in the various items of work.

If an alternative is described in the Contract, the Department pays based on the bid items for the details and specifications not described as an alternative unless the bid item is described as an alternative, in which case, the Department pays based on the details and specifications for that alternative.

The Department pays for change order work based on one or a combination of the following:

1. Bid item prices
2. Force account
3. Agreed price
4. Specialist billing

If the Engineer chooses to pay for change order work based on an agreed price, but you and the Engineer cannot agree on the price, the Department pays by force account.

If a portion of extra work is covered by bid items, the Department pays for this work as changed quantities in those items. The Department pays for the remaining portion of the extra work by force account or agreed price.

If the amount of a deduction or withhold exceeds final payment, the Department invoices you for the difference, to be paid upon receipt.

Pay your subcontractors within 10 days of receipt of each progress payment under Pub Cont Code §§ 10262 and 10262.5.

Replace Section 9-1.07 with:

9-1.07 PAYMENT ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS DOES NOT APPLY TO THIS PROJECT

Replace Section 9-1.16F with:

9-1.16F Retentions

The Department, once in each month, shall cause an estimate in writing to be made by the Engineer. The estimate shall include the total amount of work done and acceptable materials furnished, provided the acceptable materials are listed as eligible for partial payment as materials in the special provisions and are furnished and delivered by the Contractor on the ground and not used or are furnished and stored for use on the contract, if the storage is within the State of California and the Contractor furnishes evidence satisfactory to the Engineer that the materials are stored subject to or under the control of the Department, to the time of the estimate, and the value thereof. The estimate shall also include any amounts payable for mobilization. Daily extra work reports furnished by the Contractor less than 5 calendar days, not including Saturdays, Sundays and legal holidays, before the preparation of the monthly progress estimate shall not be eligible for payment until the following month's estimate.

The amount of any material to be considered in making an estimate will in no case exceed the amount thereof which has been reported by the Contractor to the Engineer on State-furnished forms properly filled out and executed, including accompanying documentation as therein required, less the amount of the material incorporated in the work to the time of the estimate. Only materials to be incorporated in the work will be considered. The estimated value of the material established by the Engineer will in no case exceed the contract price for the item of work for which the material is furnished.

The Department shall retain 5 percent of the estimated value of the work done and 5 percent of the value of materials so estimated to have been furnished and delivered and unused or furnished and stored as aforesaid as part security for the fulfillment of the contract by the Contractor. The Department will not hold retention for mobilization or demobilization.

The Department shall pay monthly to the Contractor, while carrying on the work, the balance not retained, as aforesaid, after deducting therefrom all previous payments and all sums to be kept or retained under the provisions of the contract. No monthly estimate or payment shall be required to be made when, in the judgment of the Engineer, the work is not proceeding in accordance with the provisions of the contract.

No monthly estimate or payment shall be construed to be an acceptance of any defective work or improper materials.

Attention is directed to the prohibitions and penalties pertaining to unlicensed contractors as provided in Business and Professions Code Sections 7028.15(a) and 7031.

Add Section 9-1.23:

9-1.23 RESOLUTION OF CONTRACT CLAIMS

Public works contract claims of three hundred seventy-five thousand dollars ($375,000) or less which arise between a Contractor and a local public agency shall be resolved in accordance with the provisions of California Public Contract Code Sections 20104-20104.6, inclusive. In addition, California Public Contract Code Section 9204 requires that the procedure established therein shall apply to all claims (as therein defined) filed by a contractor in connection with a public works project. Accordingly, this contract expressly incorporates all of the terms and conditions of those statutory provisions, which are as follows:

California Public Contract Code Section 9204

(a) The Legislature finds and declares that it is in the best interests of the state and its citizens to ensure that all construction business performed on a public works project in the state that is complete and not in dispute is paid in full and in a timely manner.

(b) Notwithstanding any other law, including, but not limited to, Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2, Chapter 10 (commencing with Section 19100) of Part 2, and Article 1.5 (commencing with Section 20104) of Chapter 1 of Part 3, this section shall apply to any claim by a contractor in connection with a public works project.

(c) For purposes of this section:

(1) "Claim" means a separate demand by a contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:

(A) A time extension, including, without limitation, for relief from damages or penalties for delay assessed by a public entity under a contract for a public works project.

(B) Payment by the public entity of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public works project and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled.

(C) Payment of an amount that is disputed by the public entity.

(2) "Contractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who has entered into a direct contract with a public entity for a public works project.

(3)(A) "Public entity" means, without limitation, except as provided in subparagraph (B), a state agency, department, office, division, bureau, board, or commission, the California State University, the University of California, a city, including a charter city, county, including a charter county, city and county, including a charter city and county, district, special district, public authority, political subdivision, public corporation, or nonprofit transit corporation wholly owned by a public agency and formed to carry out the purposes of the public agency.

(B) "Public entity" shall not include the following:

(i) The Department of Water Resources as to any project under the jurisdiction of that department.

(ii) The Department of Transportation as to any project under the jurisdiction of that department.

(iii) The Department of Parks and Recreation as to any project under the jurisdiction of that department.

(iv) The Department of Corrections and Rehabilitation with respect to any project under its jurisdiction pursuant to Chapter 11 (commencing with Section 7000) of Title 7 of Part 3 of the Penal Code.

(v) The Military Department as to any project under the jurisdiction of that department.

(vi) The Department of General Services as to all other projects.

(vii) The High-Speed Rail Authority.

(4) "Public works project" means the erection, construction, alteration, repair, or improvement of any public structure, building, road, or other public improvement of any kind.

(5) "Subcontractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who either is in direct contract with a contractor or is a lower tier subcontractor.

(d) (1) (A) Upon receipt of a claim pursuant to this section, the public entity to which the claim applies shall conduct a reasonable review of the claim and, within a period not to exceed 45 days, shall provide the claimant a written statement identifying what portion of the claim is disputed and what portion is undisputed. Upon receipt of a claim, a public entity and a contractor may, by mutual agreement, extend the time period provided in this subdivision.

(B) The claimant shall furnish reasonable documentation to support the claim.

(C) If the public entity needs approval from its governing body to provide the claimant a written statement identifying the disputed portion and the undisputed portion of the claim, and the governing body does not meet within the 45 days or within the mutually agreed to

extension of time following receipt of a claim sent by registered mail or certified mail, return receipt requested, the public entity shall have up to three days following the next duly publicly noticed meeting of the governing body after the 45-day period, or extension, expires to provide the claimant a written statement identifying the disputed portion and the undisputed portion.

(D) Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. If the public entity fails to issue a written statement, paragraph (3) shall apply.

(2) (A) If the claimant disputes the public entity's written response, or if the public entity fails to respond to a claim issued pursuant to this section within the time prescribed, the claimant 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 public entity shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(B) 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 public entity shall provide the claimant 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 public entity 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 public entity and the claimant sharing the associated costs equally. The public entity and claimant shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties 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.

(C) 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.

(D) Unless otherwise agreed to by the public entity and the contractor in writing, the mediation conducted pursuant to this section shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.

(E) This section does not preclude a public entity from requiring arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program, if mediation under this section does not resolve the parties' dispute.

(3) Failure by the public entity to respond to a claim from a contractor within the time periods described in this subdivision or to otherwise meet the time requirements of this section shall result in the claim being deemed rejected in its entirety. A claim that is denied by reason of the public entity's failure to have responded to a claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse finding with regard to the merits of the claim or the responsibility or qualifications of the claimant.

(4) Amounts not paid in a timely manner as required by this section shall bear interest at 7 percent per annum.

(5) If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against a public entity because privity of contract does not exist, the contractor may present to the public entity a claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that the contractor present a claim for work which was performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the claim be presented to the public entity shall furnish reasonable documentation to support the claim. Within 45 days of receipt of this written request, the contractor shall notify the subcontractor in writing as to whether the contractor presented the claim to the public entity and, if the original contractor did

not present the claim, provide the subcontractor with a statement of the reasons for not having done so.

(e) The text of this section or a summary of it shall be set forth in the plans or specifications for any public works project that may give rise to a claim under this section.

(f) A waiver of the rights granted by this section is void and contrary to public policy, provided, however, that (1) upon receipt of a claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable; and (2) a public entity may prescribe reasonable change order, claim, and dispute resolution procedures and requirements in addition to the provisions of this section, so long as the contractual provisions do not conflict with or otherwise impair the timeframes and procedures set forth in this section.

(g) This section applies to contracts entered into on or after January 1, 2017.

(h) Nothing in this section shall impose liability upon a public entity that makes loans or grants available through a competitive application process, for the failure of an awardee to meet its contractual obligations.

(i) This section shall remain in effect only until January 1, 2027, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2027, deletes or extends that date.

California Public Contract Code Sections 20104 – 20104.6

Section 20104

(a)(1) This article applies to all public works claims of three hundred seventy-five thousand dollars ($375,000) or less which arise between a contractor and a local agency.

(2) This article shall not apply to any claims resulting from a contract between a contractor and a public agency when the public agency has elected to resolve any disputes pursuant to Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2.

(b)(1) "Public work" means "public works contract" as defined in Section 1101 but does not include any work or improvement contracted for by the state or the Regents of the University of California.

(2) "Claim" means a separate demand by the contractor for (A) a time extension, (B) payment of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public work and payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or (C) an amount the payment of which is disputed by the local agency.

(c) The provisions of this article or a summary thereof shall be set forth in the plans or specifications for any work which may give rise to a claim under this article.

(d) This article applies only to contracts entered into on or after January 1, 1991.

Section 20104.2

For any claim subject to this article, the following requirements apply:

(a) The claim shall be in writing and include the documents necessary to substantiate the claim. Claims must be filed on or before the date of final payment. Nothing in this subdivision is intended to extend the time limit or supersede notice requirements otherwise provided by contract for the filing of claims.

(b) (1) For claims of less than fifty thousand dollars ($50,000), the local agency shall respond in writing to any written claim within 45 days of receipt of the claim, or may request, in writing, within 30 days of receipt

of the claim, any additional documentation supporting the claim or relating to defenses to the claim the local agency may have against the claimant.

(2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.

(3) The local agency's written response to the claim, as further documented, shall be submitted to the claimant within 15 days after receipt of the further documentation or within a period of time no greater than that taken by the claimant in producing the additional information, whichever is greater.

(c) (1) For claims of over fifty thousand dollars ($50,000) and less than or equal to three hundred seventy-five thousand dollars ($375,000), the local agency shall respond in writing to all written claims within 60 days of receipt of the claim, or may request, in writing, within 30 days of receipt of the claim, any additional documentation supporting the claim or relating to defenses to the claim the local agency may have against the claimant.

(2) If additional information is thereafter required, it shall be requested and provided pursuant to this subdivision, upon mutual agreement of the local agency and the claimant.

(3) The local agency's written response to the claim, as further documented, shall be submitted to the claimant within 30 days after receipt of the further documentation, or within a period of time no greater than that taken by the claimant in producing the additional information or requested documentation, whichever is greater.

(d) If the claimant disputes the local agency's written response, or the local agency fails to respond within the time prescribed, the claimant may so notify the local agency, in writing, either within 15 days of receipt of the local agency's response or within 15 days of the local agency's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the local agency shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(e) Following the meet and confer conference, if the claim or any portion remains in dispute, the claimant may file a claim as provided in Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code. For purposes of those provisions, the running of the period of time within which a claim must be filed shall be tolled from the time the claimant submits his or her written claim pursuant to subdivision (a) until the time that claim is denied as a result of the meet and confer process, including any period of time utilized by the meet and confer process.

(f) This article does not apply to tort claims and nothing in this article is intended nor shall be construed to change the time periods for filing tort claims or actions specified by Chapter 1 (commencing with Section 900) and Chapter 2 (commencing with Section 910) of Part 3 of Division 3.6 of Title 1 of the Government Code.

Section 20104.4

The following procedures are established for all civil actions filed to resolve claims subject to this article:

(a) Within 60 days, but no earlier than 30 days, following the filing or responsive pleadings, the court shall submit the matter to nonbinding mediation unless waived by mutual stipulation of both parties. The mediation process shall provide for the selection within 15 days by both parties of a disinterested third person as mediator, shall be commenced within 30 days of the submittal, and shall be concluded within 15 days from the commencement of the mediation unless a time requirement is extended upon a good cause showing to the court or by stipulation of both parties. If the parties fail to select a mediator within the 15-day period, any party may petition the court to appoint the mediator.

(b) (**1)** If the matter remains in dispute, the case shall be submitted to judicial arbitration pursuant to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure,

notwithstanding Section 1141.11 of that code. The Civil Discovery Act (Title 4 (commencing with Section 2016.010) of Part 4 of the Code of Civil Procedure) shall apply to any proceeding brought under this subdivision consistent with the rules pertaining to judicial arbitration.

(2) Notwithstanding any other provision of law, upon stipulation of the parties, arbitrators appointed for purposes of this article shall be experienced in construction law, and, upon stipulation of the parties, mediators and arbitrators shall be paid necessary and reasonable hourly rates of pay not to exceed their customary rate, and such fees and expenses shall be paid equally by the parties, except in the case of arbitration where the arbitrator, for good cause, determines a different division. In no event shall these fees or expenses be paid by state or county funds.

(3) In addition to Chapter 2.5 (commencing with Section 1141.10) of Title 3 of Part 3 of the Code of Civil Procedure, any party who after receiving an arbitration award requests a trial de novo but does not obtain a more favorable judgment shall, in addition to payment of costs and fees under that chapter, pay the attorney's fees of the other party arising out of the trial de novo.

(c) The court may, upon request by any party, order any witnesses to participate in the mediation or arbitration process.

Section 20104.6

(a) No local agency shall fail to pay money as to any portion of a claim which is undisputed except as otherwise provided in the contract.

(b) In any suit filed under Section 20104.4, the local agency shall pay interest at the legal rate on any arbitration award or judgment. The interest shall begin to accrue on the date the suit is filed in a court of law.

Add Section 9-1.24:

9-1.24 TESTING

Whenever a specified test as described in the CQA Plan is required and the material or portion thereof so tested fails to meet or exceed the required testing parameters specified, any tests beyond the amounts shown in the Table 9-1 “MATERIAL TESTING RATE SCHEDULE” shall be charged at the per unit rate shown in the table. The charge for each additional test beyond the amounts shown shall be deducted from the monies due or that may become due the Contractor under the contract plus an additional $200 administrative fee per re-test.

The Contractor shall provide the Engineer 24 hours notice prior to performance by the County of any compaction testing.

TABLE 9-1

MATERIAL TESTING RATE SCHEDULE

Description	ASTM Method	Unit Rate	# of tests
Geosynthetic Clay Liner			
Peel Strength	D-6496	$90.30	14
Mass per Unit Area	D-5993	$42	14
Moisture Content (bentonite)	D-5993	$42	14
Mass of Bentonite	D-5993	$42	14
Index Flux	D-5887	$320.25	1
Swell Index (bentonite)	D-5890	$114.45	14
Tensile Strength	D-6768	$590.30	14
Permeability	D-5887	$259	14

Shear Strength (GCL/subgrade)	D-6243	$945	1
Geomembrane			
Sheet Thickness	D-5994	$29.40	14
Asperity Height	D-7466	$31.50	14
Tensile Properties	D-6693	$725.45	14
Puncture Resistance	D-4833	$57.75	14
Tear Resistance	D-1004	$72.45	14
Specific Gravity	D-1505	$36.75	14
Carbon Black Content	D-1603	$47.25	14
Carbon Black Dispersion	D-5596	$57.75	14
Direct Shear	D-6243	$945	1
Seam Strength/Peel Adhesion (Geomemebrane/GCL)	D-4437	$34	175
Geocomposite			
Transmissivity	D-4716	$577.50	14
Ply Adhesion	D-7005	$72.45	14
Direct Shear (Geocomposite/Geomembrane)	D-5321	$945	1
Geotextile			
Grab Strength & Elongation	D-4632	$72.45	1
CBR Puncture Resistance	D-6241	$131.25	1
Permittivity	D-4491	$120.75	1
Apparent Opening Size	D-4751	$131.25	1
Mass per Unit Area	D-5261	$36	1
Trapezoidal Tear	D-4533		1
Soil and Rock Evaluation Testing			
Permeable Material			
Hydraulic Conductivity	D-2434	$318	3
Classification	D-2487/D-2488	$112	1
Gradation	C-136/C-137	$120	1
Operations Layer			
Sieve Analysis	D-6913	$109	10
Classification	D-2487/D-2487	$112	10
Embankment/Engineered Fill/Structural Fill			
Classification	D-2487/D-2487	$112	3
Sieve Analysis	D-6913	$109	3
Moisture/Density Relationship	D-1557	$311	1 per material
Soil and Rock Construction Testing			
Subgrade			

Moisture/Density Relationship			D-1557	$311	1 per material type
Sieve Analysis			D-6913	$109	34
Classification			D-2487/D-2488	$112	34
Sand Cone/Drive Tube			D-1556/D-2937	$35	2
Moisture Content, Nuclear Method			D-6938	$90	34
Density, Nuclear Method			D-2488	$90	34
Permeable Material					
Hydraulic Conductivity			D-2434	$318	1
Classification			D-2487/D-2488	$112	1
Gradation			C-136/C-137	$120	1
Embankment/Engineered Fill/Structural Fill					
Classification			D-2487/D-2487	$112	3
Sieve Analysis			D-6913	$109	3
Sand Cone/Drive	D-1556/D-	$35	1		
Moisture Content,	D-6938	$90	3		
Density, Nuclear	D-2488	$90	8		

DIVISION II GENERAL CONSTRUCTION

10 GENERAL

Add to the end of Section 10-1.02C(2):

Protect any irrigation component to be relocated before performing any other construction activity in the area.

Replace *Reserved* in Section 10-1.02C(3) with:

Transplant any plant to be transplanted before performing any other construction activity in the area.

Add to Section 10-5 DUST CONTROL:

A Dust Control Plan (DCP) shall be submitted to the County for review and approval by the Engineer prior to commencing any work. The Plan shall describe how the Contractor plans to control dust and abide by San Joaquin Valley Air Pollution Control District Rule 8021. The DCP shall be submitted to the Engineer for review and approval at least 30 days prior to the start of excavation activities. The Contractor will not be allowed to start any work on-site until the DCP is approved by the Engineer.

The Contractor shall be responsible for the alleviation or prevention of dust nuisance caused by construction-related traffic.

In the event the Contractor does not apply water for dust control when the road conditions require it and it becomes necessary for **the Engineer to notify the Contractor of his duty to apply water for dust control, the Contractor shall pay $200.00 per 15-minute period or portion thereof** to the County for all the time required for the alleviation or prevention of such dust.

Such payment shall commence at the time when notice of the dust condition is given to the Contractor or his authorized representative by the Engineer and shall terminate when the condition is corrected. Such payment will be deducted from the Contractor's payment.

In addition thereto, when it is necessary for the Engineer to perform the work, the Contractor shall pay the actual cost for the performance thereof. Such amount will be deducted from the Contractor's payment.

The Contractor shall be responsible for providing adequate dust control measures during the term of the Contract. Dust palliatives shall not be used without prior written authorization from the Engineer.

Dust control shall consist of furnishing water supply, required equipment, additives, accessories, and incidentals, and carrying out proper and efficient measures wherever and as often as necessary to reduce dust nuisance, and to prevent dust originating from construction operations during the completion of the Contract, as required by the Engineer.

Water shall be applied by means of pressure type distributors or pipelines equipped with a spray system or hoses with nozzles that will insure a uniform application of water.

All equipment used for the application of water shall be equipped with a positive means of shut-off.

Unless otherwise permitted by the Engineer, or unless all the water is applied by means of pipelines, at least one functional mobile unit with a minimum capacity of 5,000 gallons shall be available at the Site in operating condition for applying water at the Site during construction.

Fugitive dust emissions shall be controlled such that violations of the SJVAPCD Rule 8021 do not occur. Fines issued as a result of violating SJVAPCD Rule 8021 will be solely the responsibility of the Contractor.

Dust Control shall meet requirements of the “Title V Permit to Operate” included in the Project Details section of the Specifications.

Add to Section 10-6 WATERING:

Watering shall conform to the provisions in Section 10-6, "Watering," of the Standard Specifications and these Special Provisions.

Water necessary for dust control and compaction shall be applied by the Contractor.

There is a water tank and well located at the “Existing Pond” shown on the Plans. The Contractor may use the pond to obtain water required for dust control, soil compaction, and for hydro-seeding operations. If the Contractor uses the pond, the Contractor shall provide a pump and any other appurtenances necessary to draw water from the pond. The Contractor shall not use the existing water supply equipment to obtain water.

Any modification of existing facilities or installation or construction of tanks or other facilities for storing or pumping water shall be approved by the Engineer before the Contractor may begin such modification, installation or construction.

County landfill operators will also be using the well and/or ponding basin during construction. The Contractor is required to coordinate with County landfill operators so that normal landfill operations are not impeded by the Contractor’s operations.

When water is not needed for dust control or proper prosecution of the work, watering equipment may be removed from the project.

Add Section 10-7 COMFORMANCE WITH CQA PLAN & MONITORING:

The Project Details section of these special provisions includes the Construction Quality Assurance (CQA) Plan and it is the contractor's responsibility to be familiar therewith. The contractor is to conduct its operations required to facilitate the efforts of the CQA monitor and may be required to actively assist the CQA monitor using the Contractor's forces and equipment.

Full compensation for performing all work required to facilitate the efforts of the CQA monitor shall be considered to be included in the various items of work, and no additional compensation will be allowed therefor.

12 TEMPORARY TRAFFIC CONTROL

Add to section 12-1.01:

Landfill traffic shall be permitted to pass through construction at all times without interruption. No exceptions will be made.

Replace section 12-1.04 with:

12-1.04 FLAGGING COSTS

You pay the cost of furnishing all flaggers, including transporting flaggers and furnishing stands and towers for flaggers to provide for the passage of traffic through the work as specified in sections 7-1.03 and 7-1.04.

Replace Section 12-3.01C with:

12-3.01C Construction

If channelizing devices are used on the project, perform all layout work necessary to place channelizing devices:

1. On the proper alignment
2. Uniformly at the location and spacing described
3. Straight on a tangent alignment
4. On a true arc in a curved alignment

If temporary traffic control devices are damaged, displaced, or stop operating or functioning as described from any cause during the progress of the work, immediately repair, repaint, or replace the components and restore them to their original locations and positions.

If ordered, furnish and place additional temporary traffic control devices. This work is not change order work if:

1. Required to conform with your traffic control plan
2. Required to conform with the MUTCD
3. Necessary for public safety or convenience as determined by the Engineer
4. Required to perform staged construction shown on the plans

Replace Section 12-3.03C with:

12-3.03C Construction

If plastic traffic drums are used on project, use 1 type of plastic traffic drum on the project.

Use the same type and brand of retroreflective sheeting for all plastic traffic drums used on the project.

Do not use sandbags or comparable ballast.

Moving plastic traffic drums from location to location if ordered after initial placement is not change order work if:

1. Required to conform with your traffic control plan
2. Required to conform with the MUTCD
3. Necessary for public safety or convenience as determined by the Engineer
4. Required to perform staged construction shown on the plans

Replace Section 12-3.10C with:

12-3.10C Construction

If barricades are used on the project, place each barricade such that the stripes slope downward in the direction road users are to pass.

Place each sand-filled bag near the ground level on the lower parts of the frame or stays to serve as ballast for the barricades. Do not place ballast on top of barricades or over any retroreflective barricade rail face that is facing traffic.

Do not remove barricades that are shown to be left in place at the time of work completion.

Moving a barricade from location to location is change order work if ordered after initial placement of the barricade unless.

1. Required to conform with your traffic control plan
2. Required to conform with the MUTCD
3. Necessary for public safety or convenience as determined by the Engineer
4. Required to perform staged construction shown on the plans

Replace Section 12-3.20C(1) with:

12-3.20C1 General

If Type K temporary rail is used on the project, before placing Type K temporary railing on the job site, paint the exposed surfaces of the railing with white paint complying with the specifications for acrylic emulsion paint for exterior masonry.

Place Type K temporary railing on a firm, stable foundation. Grade the foundation to provide a uniform bearing surface throughout the entire length of the railing.

Structure excavation and backfill must comply with section 19-3 except compaction of earth fill placed behind Type K temporary railing in a curved layout is not required.

Place and maintain the abutting ends of PC concrete units in alignment without substantial offset from each other.

The drilling of holes and bonding of threaded rods or dowels must comply with the specifications for drilling and bonding dowels in section 51-1.

Install a reflector on the top or face of the rail of each rail unit placed within 10 feet of a traffic lane. Apply adhesive for mounting the reflector under the reflector manufacturer's instructions.

Install a Type P marker panel at each end of railing placed adjacent to a 2-lane, two-way highway and at the end facing traffic for railing installed adjacent to a one-way roadbed. If the railing is placed on a skew, install the marker at the end of the skew nearest the traveled way. Type P marker panels must comply with section 82 except you must furnish the marker panels.

After removing Type K temporary railing:

1. Restore the area to its previous condition or construct it to its planned condition if temporary excavation or embankment was used to accommodate the railing.
2. Remove all threaded rods or dowels to a depth of at least 1 inch below the surface of the concrete. Fill the resulting holes with mortar under section 51-1 except cure the mortar by the water method or by the curing compound method using curing compound no. 6.

If the Engineer orders a lateral move of Type K temporary railing and repositioning is not shown, the lateral move is change order work unless:

1. Required to conform with your traffic control plan
2. Required to conform with the MUTCD
3. Necessary for public safety or convenience as determined by the Engineer
4. Required to perform staged construction shown on the plans

Replace Section 12-3.22C with:

12-3.22C Construction

If crash cushion modules are used on the project, use the same type of crash cushion module for a single grouping or array.

Temporary crash cushion arrays must not encroach on the traveled way.

Secure the sand-filled modules in place before starting an activity requiring a temporary crash cushion.

Maintain sand-filled temporary crash cushions in place at each location, including times when work is not actively in progress. You may remove the crash cushions during the work shift for access to the work if the exposed fixed obstacle is 15 feet or more from the nearest lane carrying traffic. Reset the crash cushion before the end of the work shift.

Immediately repair sand-filled temporary crash cushion modules damaged due to your activities. Remove and replace any module damaged beyond repair. Repair and replacement of temporary crash cushion modules damaged by traffic are change order work.

You may place sand-filled temporary crash cushion modules on movable pallets or frames complying with the dimensions shown. The pallets or frames must provide a full-bearing base beneath the modules. Do not move the modules and supporting pallets or frames by sliding or skidding along the pavement or bridge deck.

Attach a Type R or Type P marker panel to the front of the temporary crash cushion if the closest point of the crash cushion array is within 12 feet of the traveled way. Firmly fasten the marker panel to the crash cushion with commercial quality hardware or by other authorized methods. Attach the Type R marker panel such that the top of the panel is 1 inch below the module lid. Attach the Type P marker panel such that the bottom of the panel rests upon the pallet or roadway surface if pallets are not used.

A lateral move of a temporary crash cushion module is change order work if ordered and the repositioning is not shown, unless required for staged construction.

Remove sand-filled temporary crash cushion modules, including sand, pallets or frames, and marker panels, at Contract acceptance. Do not install sand-filled temporary crash cushion modules in the permanent work.

Replace section 12-3.31C with:

12-3.31C Construction

If portable flashing beacons are used on the project, remove portable flashing beacons from the traveled way at the end of each night's work. You may store the flashing beacon at selected central locations within the highway where designated by the Engineer.

Moving portable flashing beacons from location to location if ordered after initial placement is change order work unless:

1. Required to conform with your traffic control plan
2. Required to conform with the MUTCD
3. Necessary for public safety or convenience as determined by the Engineer
4. Required to perform staged construction shown on the plans

Replace Section 12-3.35B(6) with:

12-3.35B(6) User Interface

If the project includes an AWIS, the system must have a user interface to control the AWIS PCMS communications. The interface must be (1) software compatible with a Windows environment or (2) a web service accessed by a web browser.

Provide any software on a CD or other Engineer-authorized data-storage device.

The user interface must, at a minimum, provide the user with a list of AWIS PCMSs in the field, location information for each AWIS PCMS, and a real-time on-board display of the message in the field. Control options must, at a minimum, provide the user the ability to change the on-board messages and flash rate.

Replace Section 12-4 with:

12-4 MAINTAINING TRAFFIC

12-4.01 GENERAL

12-4.01A General

Section 12-4.01 includes general specifications for maintaining traffic through construction work zones.

If local authorities regulate traffic, notify them at least 5 business days before the start of job site activities. Cooperate with the local authorities to handle traffic through the work zone and to make arrangements to keep the work zone clear of parked vehicles.

12-4.01B Materials

Not Used

12-4.01C CONSTRUCTION

Furnishing and operating pilot cars is not change order work.

12-4.01D Payment

Not Used

12-4.02 TRAFFIC CONTROL SYSTEMS

12-4.02A General

12-4.02A(1) Summary

Section 12-4.02 includes specifications for providing a traffic control system to close traffic lanes, shoulders, and roadways.

A traffic control system for a closure includes the temporary traffic control devices described as part of the traffic control system. Temporary traffic control devices must comply with section 12-3.

12-4.02A(2) Definitions

designated holidays: Designated holidays are shown as “holidays” in Section 1-1.07B.

12-4.02A(3) Submittals

12-4.02A(3)(a) General

The Contractor shall prepare and submit to the County Construction Engineer for approval, a traffic control system plan indicating the means and methods he will employ to institute and maintain traffic control for all phases of the work within the project. The traffic control system plan shall be submitted to the County Construction Engineer as early as possible, preferably **five (5) working days** prior to pre-construction meeting. The Engineer will require five (5) working days to review the initial submittal of the traffic control system plan and an additional five (5) working days for each successive review.

At a minimum the TCP shall include:

a. Traffic flow map, including Contractor's equipment and landfill traffic flow patterns

b. Alternate routes

c. Times of day and schedule for traffic plan operations

d. Locations of signs and traffic control devices and their types (if required)

e. Flag person’s number and locations (if required)

No work at the project site whatsoever, including preparatory work such as the installation of construction project funding signs, shall commence until the traffic control system plan has been approved in writing by the Engineer. In the event that the traffic control system plan is not submitted timely, the Engineer may issue a notice of commencement of contract time prior to approval of the traffic control system plan, and working days will begin to accrue against the allotted contract time.

Late submittal of the traffic control plan or revisions thereafter required, due to the inadequacy of the plan, shall not be accepted as justification for the delay in the start of the working days for the project.

It shall be the Contractor's responsibility to provide, install, maintain, and remove any and all detour signage and traffic control devices and to obtain all permits, including permits from Caltrans, as may be necessary to establish detours as part of the contractor's traffic control plan.

Traffic will not be allowed to be limited to one direction when construction activities are not actively in progress. Providing, installing, maintaining, and removing all traffic control, including portable changeable message signs if required, obtaining and complying with all permits, and providing all traffic control operations shall be the responsibility of the contractor, and no additional compensation will be allowed therefor.

12-4.02A(3)(b) Closure Schedules

One-way traffic shall be controlled through the project in accordance with the California Manual MUTCD and Caltrans Standard Plans T-11 and T-13 entitled "Traffic Control System for Lane Closure on Multilane Conventional Highways" and "Traffic Control System for Lane Closure on Two Lane Conventional Highways," and these special provisions. Night closure will not be permitted.

When traffic is under one way control on unpaved areas, the cones shown along the centerline on the plan need not be placed.

Every Monday by noon, submit a closure schedule request for planned closures for the next week.

The next week is defined as Sunday at noon through the following Sunday at noon.

Submit a closure schedule request 5 days before the anticipated start of any job site activity that reduces:

1. Horizontal clearances of traveled ways, including shoulders, to 2 lanes or fewer due to activities such as temporary barrier placement and paving
2. Vertical clearances of traveled ways, including shoulders, due to activities such as pavement overlays, overhead sign installation, or falsework girder erection

Submit closure schedule changes, including additional closures, by noon at least 3 business days before a planned closure.

Cancel closure requests at least 48 hours before the start time of the closure.

The Department notifies you of unauthorized closures or closures that require coordination with other parties as a condition for authorization.

12-4.02A(3)(c) Contingency Plans for Closures

Submit a contingency plan for an activity that could affect a closure if a contingency plan is specified in the special provisions or if a contingency plan is requested.

Submit a contingency plan for each of the following activities:

1. Activity requiring a complete roadway closure

If a contingency plan is requested, submit the contingency plan within 1 business day of the request.

The contingency plan must identify the activities, equipment, processes, and materials that may cause a delay in the opening of a closure to traffic. The plan must include:

1. List of additional or alternate equipment, materials, or workers necessary to ensure continuing activities and on-time opening of closures if a problem occurs. If the additional or alternate equipment, materials, or workers are not on the job site, specify their location, the method for mobilizing these items, and the required time to complete mobilization.
2. General time-scaled logic diagram displaying the major activities and sequence of the planned activities. For each activity, identify the critical event that will activate the contingency plan.

Submit revisions to a contingency plan at least 3 business days before starting the activity requiring the contingency plan. Allow 2 business days for review.

12-4.02A(4) Quality Assurance

Reserved

12-4.02B Materials

Not Used

12-4.02C Construction

12-4.02C(1) General

Traffic will be controlled by flagmen by eyesight, radio (walkie talkie) or baton. In the event these methods do not work satisfactorily, as determined by the Engineer, a pilot car will be required.

The Engineer may require a pilot car to be used during earthwork operations in preparation of the grading plane or other operations when the Contractor's operations cover an area beyond the line of sight, or beyond the range of radios or when the baton method does not function satisfactorily.

Work that interferes with traffic is limited to the hours when closures are allowed.

Additional advance flaggers are required.

For traffic under 1-way control on unpaved areas, the cones along the centerline need not be placed.

You may use a pilot car to control traffic. If a pilot car is used for traffic control, the cones along the centerline need not be placed. The pilot car must have radio contact with personnel in the work area. Operate the pilot car through the traffic control zone at a speed not greater than 25 miles per hour.

12-4.02C(3) Closure Requirements and Charts

12-4.02C(3)(a) General

Where 2 or more lanes in the same direction, including the shoulders, are adjacent to the area where the work is being performed, close the adjacent lane under any of the following conditions:

1. Work is off the traveled way but within 6 feet of the edge of the traveled way, and the approach speed is greater than 45 mph
2. Work is off the traveled way but within 3 feet of the edge of the traveled way, and the approach speed is less than 45 mph

Closure of the adjacent traffic lane is not required during any of the following activities:

1. Work behind a barrier
2. Paving, grinding, or grooving
3. Installation, maintenance, or removal of traffic control devices except for temporary railing

12-4.02C(3)(b) - 12-4.02C(3)(n)

Reserved

12-4.02C(3)(o) Closure of Conventional County Roads

The type and location of signs, lights, flags, flagmen, and other traffic control and safety devices shall be in accordance with the current edition of the California Manual on Uniform Traffic Control Devices (MUTCD) issued by the State of California, Department of Transportation (Caltrans).

Allow public traffic to pass through construction at all times unless otherwise specified herein.

Provide access to properties abutting the project site at all times.

When directed by the Engineer, traffic shall be routed through the work under one-way control.

Under one-way reversing traffic control operations, public traffic may be stopped in one direction for periods not to exceed 10 minutes.

Lane closure is defined as the closure of a traffic lane or lanes within a single traffic control system.

No work that would require a lane closure shall be performed.

Keep access roads accessible at all times.

Maintain vehicular access to the channel bank access roads at all times.

Personal vehicles of the Contractor's employees shall ONLY be parked in areas approved by the Engineer.

12-4.02C(3)(o)–12-4.02C(3)(s) Reserved

12-4.02C(4)–12.4.02C(6) Reserved

12-4.02C(7) Traffic Control System Requirements

12-4.02C(7)(a) General

Control traffic using stationary closures.

If components of the traffic control system are displaced or cease to operate or function as specified, immediately repair them to their original condition or replace them and place them back in their original locations.

Vehicles equipped with attenuators must comply with section 12-3.23.

Each vehicle used to place, maintain, and remove components of a traffic control system on a multilane highway must have a Type II flashing arrow sign that must operate whenever the vehicle is used for placing, maintaining, or removing the components. For a stationary closure, vehicles with a Type II flashing arrow sign not involved in placing, maintaining, or removing the components must display only the caution display mode. If a flashing arrow sign is required for a closure, activate the sign before the closure is in place.

12-4.02C(7)(b) Stationary Closures

Except for channelizing devices placed along open trenches or excavations adjacent to the traveled way, remove the components of the traffic control system for a stationary closure from the traveled way and shoulders at the end of each work period. You may store the components at authorized locations within the limits of the highway.

If a traffic lane is closed with channelizing devices for excavation work, move the devices to the adjacent edge of the traveled way when not excavating. Space the devices as shown for the lane closure.

12-4.02C(7)(c) Moving Closures

For a moving closure, use a PCMS that complies with section 12-3.32 except the sign must be truck mounted. The full operational height to the bottom of the sign may be less than 7 feet above the ground but must be as high as practicable.

If you use a flashing arrow sign in a moving closure, the sign must be truck mounted. Operate the flashing arrow sign in the caution display mode if it is being used on a 2-lane, two-way highway.

12-4.02C(8) Traffic Control System Signs

12-4.02C(8)(a) General

Traffic control system signs must comply with section 12-3.11.

12-4.02C(8)(b) Connector and Ramp Closure Signs

Inform motorists of a temporary closing of a (1) connector or a (2) freeway or expressway entrance or exit ramp using:

1. SC6-3(CA) (Ramp Closed) sign for closures of 1 day or less
2. SC6-4(CA) (Ramp Closed) sign for closures of more than 1 day

SC6-3(CA) and SC6-4(CA) signs must be stationary mounted at the locations shown and must remain in place and visible to motorists during the connector or ramp closure.

Notify the Engineer at least 2 business days before installing the sign and install the sign from 7 to 15 days before the closure.

12-4.02C(10)–12-4.02C(11) Reserved

12-4.02C(12) Failure to Provide Traffic Control.

If you do not provide the traffic control and it becomes necessary for the Engineer to notify you of your duties according to the Standard Specifications and these special provisions, you will pay $200 per 15-minute period or portion thereof to the County for all the time required to acquire the traffic control, including pilot car.

Such payment shall commence at the time notice of the improper traffic control condition is given to you or your authorized representative by the Engineer and shall terminate when the condition is corrected. Such payment will be deducted from your payment.

In addition, when it is necessary for the Engineer to perform the work, you will pay the actual cost for the performance thereof. Such amount will be deducted from the your payment. This will be in addition to any penalties imposed in these special provisions.

The provisions in this section will not relieve you from your responsibility to provide such additional devices or take such measures as may be necessary to comply with the provisions in Section 7-1.04, "Public Safety," of the Standard Specifications.

12-4.02D Payment

The Department pays for change order work for a traffic control system by force account for increased traffic control and uses a force account analysis for decreased traffic control.

Traffic control system for lane closure is paid for as traffic control system. Flagging costs are paid for as specified in section 12-1.04.

The requirements in section 4-1.05 for payment adjustment do not apply to traffic control system. Adjustments in compensation for traffic control system will be made for an increase or decrease in traffic control work if ordered and will be made on the basis of the cost of the necessary increased or decreased traffic control. The adjustment will be made on a force account basis for increased work and estimated on the same basis in the case of decreased work.

A traffic control system required by change order work is paid for as a part of the change order work.

Full compensation for furnishing and operating the pilot car, (including driver, radios, and any other equipment and labor required) shall be considered as included in the contract lump sum price paid for traffic control system and no further payment will be made.

13 WATER POLLUTION CONTROL

Replace 13-1.01A with:

13-1.01A Summary

Section 13-1 includes general specifications for preventing, controlling, and abating water pollution within waters of the State.

Information on forms, reports, and other documents is in the following Caltrans manuals:

1. Field Guide to Construction Site Dewatering
2. Stormwater Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual
3. Construction Site Best Management Practices (BMPs) Manual
4. Construction Site Monitoring Program Guidance Manual

You may view these manuals at the Stormwater and Water Pollution Control Information link at the Caltrans Division of Construction website or purchase them at the Caltrans Publication Distribution Unit.

A WPCP and a SWPPP must comply with the Caltrans Stormwater Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual and must be prepared using the latest template posted on the Construction stormwater website.

Replace Section 13-1.01D(2) with

13-1.01D(2) Regulatory Requirements

Comply with the discharge requirements in the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities; Order No. 2009-000 9-DWQ, CAS000002 (Construction General Permit) and any amendments thereto issued by the SWRCB. The Construction General Permit may be found at:

http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml

Discharges from manufacturing facilities, such as batch plants and crushing plants, must comply with the discharge requirements in the NPDES General Permit for Storm Water Discharges Associated with Industrial Activities; Order No. 2014-0057-DWQ, CAS000001 (Industrial General Permit), issued by the SWRCB. For the Industrial General Permit, go to the SWRCB website.

For a batch plant and crushing plant outside a job site or within a job site that serves one or more contracts, obtain coverage under the Industrial General Permit before operating a batch plant to manufacture concrete, HMA, or other material or a crushing plant to produce rock or aggregate.

Replace Section 13-1.01D(4)(b) with:

13-1.01D(4)(b) Qualifications

The WPC manager must:

1. Comply with the requirements provided in the Construction General Permit for:
   1.1. QSP if the project requires a WPCP
   1.2. QSD if the project requires a SWPPP
2. Complete the stormwater management training described at the Stormwater and Water Pollution Control Information link at the Caltrans Division of Construction website

Add to Section 13-2.01A Summary:

The SWPPP shall include a list of potential pollution sources and measures that will be implemented to address these issues. Additionally, the SWPPP shall include a discussion of how leachate generation will be prevented, minimized, and handled if developed.

Replace Section 13-2.04:

13-2.04 PAYMENT

The Department pays for prepare water pollution control program as follows:

1. Total of 50 percent of the item total upon authorization of the WPCP
2. Total of 90 percent of the item total upon work completion
3. Total of 100 percent of the item total upon Contract acceptance

Replace Section 13-3.04:

13-3.04 PAYMENT

For a project with 60 original working days or less, the Department pays for prepare stormwater pollution prevention plan as follows:
1. Total of 75 percent of the item total upon authorization of the SWPPP approved by the Engineer.
2. Total of 100 percent of the item total upon Contract acceptance

For a project with more than 60 original working days, the Department pays for prepare stormwater pollution prevention plan as follows:
1. Total of 50 percent of the item total upon authorization of the SWPPP approved by the Engineer
2. Total of 90 percent of the item total upon work completion
3. Total of 100 percent of the item total upon Contract acceptance.

The Department does not pay for the preparation, collection, laboratory analysis, and reporting of stormwater samples for nonvisible pollutants if WPC practices are not implemented before precipitation or if you fail to correct a WPC practice before precipitation.

The Department pays:
1. $500 for each authorized rain event action plan
2. $2,000 for each authorized stormwater annual report upon acceptance by RWQCB

The Department does not adjust the unit price for an increase or decrease in the quantity of:
1. Rain event action plan
2. Storm water sampling and analysis day

3. Storm water annual report

14 ENVIRONMENTAL STEWARDSHIP

Add after the 3rd paragraph of section 14-10.01:

Food scraps, paper wrappers, food containers, cans, bottles and all food related trash and litter must be removed from the project site at the end of each working day.

Replace the 7th paragraph of section 14-10.01 with:

Furnish and use closed-lid trash containers in the job-site yard, field trailers, and locations where workers gather for lunch and breaks.

Add Section 14-12.04:

14-12.04 RELATIONS WITH SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT (SJVAPCD)

You are responsible for compliance with all applicable SJVAPCD regulations and requirements. This section is provided for your information, and nothing herein or elsewhere within these special provisions shall be construed as limiting your responsibility for complying with all applicable rules and regulations.

It has been determined that the provisions of SJCAPCD RULE 9510 INDIRECT SOURCE REVIEW (ISR) do not apply to this project. The determination letter from SJVAPCD is included in the Project Details of these Special Provisions.

In accordance with SJVAPCD Regulation VIII – Fugitive PM10 Prohibitions: Rule 8021, implementation of an SJVAPCD-approved dust control plan is required prior to commencement of any dust generating activities.

Prepare and submit a dust control plan to provide any information to the extent necessary to accurately reflect your proposed operations. The Engineer completes the review within two working days after receipt thereof. In the event that the Engineer determines your submittal as incomplete or inadequate submit a corrected plan. The Engineer completes review of any re-submittal within two working days after receipt thereof.

Upon approval by the Engineer, submit the proposed dust control plan to the SJVAPCD. Pay to the SJVAPCD any fees which may be required for the dust control plan. You are solely responsible for prompt preparation and submittal to the Engineer, and immediately upon approval by the Engineer, submittal to the SJVAPCD of all proposed modifications to the dust control plan.

Do not commence work until the SJVAPCD has approved or conditionally approved the dust control plan and the Engineer authorizes. When a modification to an approved dust control plan is under consideration do not perform work which is inconsistent with the approved dust control plan prior to receiving written approval.

Compensation for delays associated with review and approval of dust control plans is only considered in the event that: 1) the Engineer fails to review any dust control plan submitted by the Contractor within two working days after submittal thereof by the Contractor; or 2) the SJVAPCD fails to review and to either approve or disapprove a dust control plan within 30 calendar days after their receipt thereof. Disapproval of a proposed dust control plan by the Engineer or by the SJVAPCD shall not be considered as a basis for an extension of contract time nor as the basis for any additional compensation. Only in the event that it is determined by the Engineer that the Contractor was unreasonably delayed, through no fault of the Contractor, will compensation for delays be considered in conformance with the provisions in Section 8-1.07, “Delays,” of the Standard Specifications.

It is your responsibility to be fully informed of the requirements of the Dust Control Plan and all rules, regulations, plans and conditions that may govern your operations and to conduct the work accordingly.

You must comply with the modifications to the Dust Control Plan approved by the SJVAPCD and accepted by the Engineer. Ensure the provisions of this section and SJVAPCD-approved Dust Control Plan is made part of every subcontract executed pursuant to this contract.

Full compensation for preparing and submitting the Dust Control, revising and resubmitting it as necessary until approved by the SJVAPCD, and paying the necessary fees shall be included in the bid item DUST CONTROL PLAN and no further compensation shall be paid therefor.

Replace Section 14-12.05–14.12.08 With:

14-12.05–14.12.08 RESERVED

DIVISION III EARTHWORK AND LANDSCAPPE

17 GENERAL

Replace the 4th paragraph in section 17-2.03A with:

Clear and grub vegetation only within the excavation and embankment slope lines.

19 EARTHWORK

Add Section 19-2.01A Summary:

1. Excavation of the access road, maintenance pad and road side ditch to Module 9 and 10 from STA 10 to STA 26+80

Replace Section 19-4 ROCK EXCAVATION with:

Section 19-4 LANDFILL EARTHWORK:

19-4.01 GENERAL

Earthwork shall conform to the provisions in Section 19 of the Standard Specifications and these Special Provisions.

Except where a different relative compaction is specified in these Special Provisions, all embankment for the project shall be compacted in lifts to 90% relative compaction in accordance with the requirements in Section 19-5, “Compaction,” of the Standard Specifications.

The County will perform construction verification survey for this project.

Quality Assurance:

A. A Construction Quality Assurance (CQA) Plan has been developed in conjunction with this project and is included with these Technical Specifications for the Contractor's reference. The Contractor shall assure that the Engineer and the CQA Officer, or the Officer’s designated representative, have safe access to the work for the purpose of monitoring, observation, and CQA Plan implementation at all times.

B. The Contractor shall allow for all required CQA Consultant observations, sampling, and testing at

no additional cost to the County.

C. The CQA Officer or their designee will perform the tests required by the Construction Quality Assurance Plan on a regular basis; these tests are a minimum requirement. Additional tests may be performed at the CQA Officer's discretion.

D. The CQA Officer and/or CQA Monitor will take soil samples and perform moisture, density, gradation, and other tests to ascertain that the work is being performed in compliance with these Specifications. The CQA Officer and/or CQA Monitor will conduct density and other tests on the fill, and related laboratory testing as specified in these special provisions and as outlined in the Construction Quality Assurance Plan. The Contractor shall remove surface material and render assistance as necessary to enable sampling and testing.

E. Methods of Sampling and Testing are described in the CQA Plan.

F. Suitability of Materials: The suitability of all materials will be established by the Engineer and verified in the field by the CQA Officer. Fill material shall be approved material from required excavations, stockpiles, or Contractor-selected off-site sources, as directed by the Engineer.

G. The CQA Officer may direct that inspection trenches or test pits be cut into fills to determine that the Specifications have been met. Such trenches or pits will be of limited depth and size, and shall be backfilled with the material excavated there from, or other fill material meeting the requirements for the zones cut into. Backfill shall be compacted to a density at least equal to that specified for contiguous fills.

H. If, based on the results of conformance testing and/or in the opinion of the CQA Manager and/or CQA Monitor, the materials or work observed does not satisfy the project requirements, it shall be replaced and/or re-worked to the to meet project specifications to the satisfaction of the CQA Manager and/or CQA Monitor. Rework shall be retested by the CQA Manager, CQA Monitor, or a designated representative as needed. The Contractor shall be responsible for the costs of additional testing.

A. SURPLUS MATERIAL – All surplus excavated soil which is not used in the construction of the operations layer, embankment, or backfill, shall be transported to and distributed within the Permanent Stockpile Area as shown on the Plans, as specified in these Special Provisions and as directed by the Engineer.

B. MODULE EXCAVATION - Excavation and embankment construction for Modules 9 & 10 shall conform to the Plans and these Special Provisions. Modules 9 & 10 shall be excavated and embankment shall be constructed to the lines and grades shown on the Plans and as directed by the Engineer.

Excavation from Modules 9 & 10 shall be used for embankment construction where necessary at the top of the module slopes to obtain the desired Geosynthetic Clay Liner (GCL) subgrade elevations as shown on the Plans. The embankment within the Modules 9 & 10 area shall be compacted to 95% relative compaction as specified in Section 19-4.01C, "Modules 9 & 10 Subgrade Preparation," of these Special Provisions.

Requirements for embankment construction beyond the limits of the GCL are included in Section 19-4.01C , "Modules 9 & 10 Subgrade Preparation," of these Special Provisions.

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

C. MODULES 9 & 10 SUBGRADE PREPARATION - This section shall be used along with Section 100-1.03.1, "Preparation of Subgrade", of these Special Provisions. The term subgrade as used in this section (Section 19-4.01C) shall refer to the surface directly beneath the GCL unless otherwise noted in the Plans or these Special Provisions. Modules 9 & 10 subgrade preparation shall only be performed where the Geosynthetic Clay Liner (GCL) is to be placed. Subgrade preparation for areas outside the area defined by the limits of the placement of GCL shall be performed in accordance with the requirements in the appropriate section of these Special Provisions and in accordance with the applicable requirements in the Standard Specifications for the type of construction in question.

The subgrade surface, prior to placement of the GCL, shall be graded to the lines and grades shown on the Plans. The uppermost eight (8) inches shall be scarified, brought to moisture content within two (2) percent of optimum conditions and compacted to 95% of maximum dry density, as determined by ASTM methods.

Where embankment will be beneath the GCL, the embankment shall be compacted in lifts to 95% relative compaction and the uppermost eight (8) inches of embankment shall be scarified and re-compacted in accordance with the requirements in the preceding paragraph. Compaction will be achieved by means of available earthwork equipment suitable for achieving with consistency the requirements stated in these Special Provisions.

Where embankment or excavation is to be constructed beyond the limits of the GCL, the existing ground surface shall be cleared of all vegetation and deleterious materials, shall be scarified to a depth of 0.5-foot, watered, and compacted to 90% relative compaction. The embankment shall then be placed and compacted in lifts to 90% relative compaction. Compaction shall be achieved by means of available earthwork equipment suitable for achieving with consistency the requirements stated in these Special Provisions.

Following compaction, the prepared subgrade surface shall be "proof-rolled". The proof-rolling shall be performed with at least one pass of a roller type compactor weighing at least **8 tons**. Soft areas and areas exhibiting "pumping" shall be excavated, moisture conditioned, and re-compacted to the requirements of these Special Provisions. In the event unsuitable material is encountered below the subgrade elevations as determined by the Engineer, said unsuitable material shall be excavated, disposed of, and replaced as specified in Section 19-4D, “Unsuitable Material” and as directed by the Engineer.

The finished subgrade surface shall be graded to within one-tenth of one foot of the grades shown on the Plans. The surface shall be free of surface irregularities, runs, loose soil, rocks, stones, sticks, roots, sharp objects, voids, cracks, and ruts.

At such time that the Contractor believes that a portion of the subgrade has been prepared and conforms to the requirements in these Special Provisions, and at the grades shown on the plans, the Contractor shall, in writing, inform the Engineer that the subgrade or portion thereof is ready for verification by the CQA Monitor. The Contractor shall provide such written notice no less than three working days in advance of the day upon which a particular verification is being requested.

For purposes of subgrade verification, the subgrade shall be prepared in no more than four segments, and the Contractor may request up to four verification surveys for the entire site as the preparation of a given segment is completed.

The CQA Monitor will notify the Chief of Surveys of the County of Fresno that the subgrade is ready for a verification survey. The subgrade surface will be surveyed on a 50’ x 50’ grid by the County of Fresno to ensure proper grades prior to placement of the GCL.

The County of Fresno’s licensed surveyor shall provide the CQA Monitor with point over point subgrade survey in AutoCAD format for comparison with each of the design grades. The Contractor shall not place GCL until the grades of the entire site have been checked and determined to be within the design tolerance required by the Specifications at each point. If it is determined the grades are not in compliance with the design grades, the Contractor shall rework the subgrade areas not in compliance with the design grades to achieve the design grades. At such time that the Contractor believes that the reworked subgrade area is in compliance with the design grades and conforms to the requirements in these Special Provisions, the Contractor shall, in writing, inform the Engineer that the subgrade or portion thereof is ready for verification by the CQA Monitor. The Contractor shall provide such written notice no less than three working days in advance of the day upon which a particular verification is being requested.

In the event that the Contractor requests more than four verification surveys for the entire site or in the event that the subgrade surface, or a portion thereof, is found not to be in compliance with the requirements in these Special Provisions, the Contractor shall pay to the County the actual cost incurred by the County to perform verification surveys in excess of the number allowed found to be not in compliance with the requirements in these Special Provisions.

The Contractor is hereby notified that the cost of a County of Fresno survey to verify one (1) module is $2,500.00, or $5,000 for the entire site. The cost incurred by the County to perform the verification survey in excess of the number allowed shall be proportional to the area being re-verified to the area of one module but in no case less than $800. Such payments will be deducted from payments made to the Contractor.

The subgrade surface shall be maintained at a moisture content, as directed by the Engineer, sufficient to prevent excessive drying and cracking of the prepared surface. Protect and maintain approved subgrade in finished condition until covered with geosynthetics. Damage to the approved subgrade will be repaired at Contractor's expense. GCL shall not be placed until the subgrade surface has been inspected and accepted by the Installer and CQA Monitor in accordance with the requirements in Section 100-1.03.1.F of these Special Provisions.

The construction of the subgrade shall be strictly controlled and documented in compliance with these specifications. The Engineer may perform random grade checks and/or may perform additional testing of the subgrade surface to verify conformance with these Special Provisions at any time.

During construction, the CQA Consultant will perform the following testing of the Modules 9 and 10 subgrade:

1. Laboratory compaction characteristics of soils using Modified Effort ("Modified Proctor" method) (D1557) One test minimum per material type.
2. Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis Sieve Analysis (D6913). One test minimum per one acre.
3. Standard Test Methods for Identify and Classification of Soils Type (ASTM D2487/D2488). One test per one acre. A passing result shall indicate that the subgrade soil is well-graded and amenable to compaction.
4. In-Situ Moisture and Dry Density Determinations (ASTM D6938). One Test Minimum Per 1 acres.
5. Sand Cone (ASTM D1556) or Drive Tube (ASTM D2937). One for every 20 nuclear gauge tests .

For the gradation of the subgrade to be deemed acceptable, the results of the ASTM D422 test must indicate that 100% of the test sample passes a 0.5 inch sieve and that no less than 30% passes a #200 sieve. In the event that a sample or samples fail to meet this criteria, the CQA Monitor may perform additional ASTM D422 tests to determine the extent of the unsuitable material. Unsuitable material will be removed and replaced as directed by the Engineer in accordance with Section 19-4D, "Unsuitable Material".

In the event that any of the preceding tests indicate failing results, the Contractor shall perform corrective measures to the subgrade area represented by the failing test result. The area of the subgrade represented by a test result will be determined by the Engineer.

If the failing result is due to a deficiency in the existing subgrade material, as determined by the Engineer, such corrective measures shall involve the replacement of the material in accordance with the requirements in Section 19-4D, "Unsuitable Material," of these Special Provisions.

If the failing result is due to a deficiency in the Contractor's subgrade preparation operations, as determined by the Engineer, the Contractor shall perform corrective measures to the area represented by the failing test result as directed by the Engineer, and no additional compensation will be allowed therefor. After such corrective measures have been performed, retests shall be performed by the CQA Monitor for all tests which failed previously.

In the event that the total number of tests and retests exceeds the number of tests allowed in Table 9-1 shown in Section 9-1.24, then the Contractor shall pay to the County the penalty for each test performed in excess of the number of allowed per that table, plus a $200 administrative fee per re-test.

Such payments will be deducted from payments made to the Contractor.

The Contractor shall coordinate with the Engineer and shall schedule construction operations to facilitate establishment of the grid and the performance of subgrade materials testing by the CQA Monitor. Full compensation for coordinating with the Engineer and scheduling construction operations accordingly shall be considered to be included in the various items of work and no additional compensation will be allowed therefor.

The Contractor shall grade areas to drain where shown on the Plans.

All existing drainage ditches and drainage pipes to remain.

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

D. UNSUITABLE MATERIAL - In the event unsuitable material is encountered below the subgrade elevations as determined by the Engineer, said unsuitable material shall be excavated to a depth of 2 feet, disposed of, and replaced as shown on the Plans with suitable material, as specified in these Special Provisions, and as directed by the Engineer.

When unsuitable material is removed and disposed of, the resulting space shall be filled with material obtained from other areas of the excavation which is suitable for the planned use. Such suitable material shall be placed and compacted in layers as specified in these Special Provisions and in Section 19 of the Standard Specifications for constructing embankments.

If the unsuitable material to be replaced is within the Modules 9 & 10 area, suitable materials shall be prepared as specified in accordance with the requirements for module subgrade preparation.

If the unsuitable material to be replaced is not within the Modules 9 & 10 area, suitable materials shall be prepared as specified in accordance with the requirements for embankment which is beyond the limits of the GCL in Section 19-4C, “Modules 9 & 10 Subgrade Preparation” of these Special Provisions.

Disposal of unsuitable material shall involve loading, hauling, and depositing the unsuitable material at the stockpile locations as shown on the Plans, as directed by the Engineer, and as specified in these Special Provisions.

The quantity of unsuitable material to be removed, disposed of and replaced with suitable materials shall be determined from lines as established by the Engineer. Excavation and replacement of materials beyond the lines as determined by the Engineer will not be paid for.

The Contractor shall be responsible for excavating unsuitable material to a depth of 2 feet and for selecting the material obtained from other areas of the excavation to be used for replacement.

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

E. EXCAVATED MATERIAL HAUL ROUTES – The Construction drawings depict location of scrappers haul routes from Module 10 to the designated Stockpile area. Any other necessary miscellaneous grading and access to and from the Modules and the stockpile area shall be accounted for in the various items of work.

The Contractor’s equipment and materials shall not remain within 50 feet of any disposal site operations or entry road when not in use.

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Full compensation for providing all labor, material, equipment and incidentals and for doing all the work involved in proposing and constructing haul routes and backfilling and restoring grades except for the two haul routes depicted in the plans, shall be included in the unit prices paid for the various items of work and no additional compensation will be allowed therefor.

19-4.02 PERMANENT STOCKPILE AREA

The Contractor shall utilize the area designated on the Plans as Permanent Stockpile Area in accordance with these Special Provisions and as directed by the Engineer.

Permanent Stockpile Area shall be used by the Contractor to place excavated earthen material which is not used for the construction of the operations layer, embankment, access road, winter pad or backfill. Material shall be placed in Permanent Stockpile Area 1 as follows:

- As the stockpile areas are filled by the Contractor, the Contractor shall deposit material such that an ingress ramp is created commencing in the vicinity of the north of Permanent Stockpile Area.

- As the stockpile areas are filled by the Contractor, the Contractor shall deposit material such that a ramp is created commencing in the vicinity of the northwest and northeast corners of Permanent Stockpile Areas as shown on the plans. The Contractor shall also deposit material such that an access ramp is created commencing in the vicinity of the south side of Permanent Stockpile Areas for Owner's equipment to access to it. Any ramp built within stockpile area shall follow the parameters listed below.
- Such ramps shall each be 30 feet wide.
- Such ramps shall have a longitudinal grade of no more than 13%.
- Stockpile area must be filled to a minimum grade of the original ground, as determined by the Engineer.
- The side slopes of the stockpiles shall be 2:1.
- One 15 foot wide bench shall be constructed approximately 50 feet above original ground.
- The height of the stockpile shall not exceed an elevation of 280 feet.
- Material shall be deposited such that, on an ongoing basis, the uppermost surface of the stockpile shall be planar, spread evenly over the entire area designated as stockpile in the Construction Drawings and shall drain at a slope of 2% to the east. If material is placed in a manner which will cause ponding of water or drainage in an improper direction, the Contractor shall be required to grade the stockpile area as directed by the Engineer.
- No minimum compaction requirements are associated with the stockpile area; however, the Contractor shall be solely responsible for placing and maintaining the stockpile in the configuration as required herein. In the event that the Contractor has to repair slides, slip outs or other deviations from the required stockpile configuration, no additional compensation will be allowed therefor.

The owner will continue to use material from Permanent Stockpile Area for daily operations, and it is anticipated that the average elevation of Permanent Stockpile Area will be lower when construction begins, and no additional compensation will be allowed for such variation in elevation.

Contractors are advised that the Owner's equipment will be operating in the area designated as Permanent Stockpile Area during construction. The Owner operates up to three scrapers to pick up soil for daily cover operations, and the Contractor's equipment is required to be operated such that the Owner's operations are not impeded. The frequency of the Owner's operations in Permanent Stockpile Area is variable.

For the Contractor's information only, the Owner's scrapers (one 33 cubic yard capacity and two 23 cubic yard capacity) operate continuously up to six to eight hours each working day, making up to seven round-trips to Permanent Stockpile Area each hour.

Selected sandy soil from the excavation to be used for the construction of the operations layer shall be stockpiled in the Permanent Stockpile Area. Excavated material to be used in the construction of embankment shall also be placed in Permanent Stockpile Area.

No stockpiling or Contractor traffic of any kind will be allowed on completed landfill modules.

Excavated material placed in the Permanent Stockpile Area shall be deposited in such a manner that the area will drain in the proper direction. If material is placed in a manner which will cause ponding of water or drainage in an improper direction, the Contractor shall grade the area as directed by the Engineer.

Full compensation for providing all labor, material, equipment and incidentals and for doing all the work involved in placing material in the Permanent Stockpile Area and transporting and placing excess material in the Permanent Stockpile Area , as shown on the Plans, specified in these Special Provisions and as directed by the Engineer, shall be included in the unit prices paid for the various items of work and no additional compensation will be allowed therefor.

Full compensation for providing all labor, material, equipment and incidentals and for doing all the work involved in transporting and placing material in the Permanent Stockpile Area without impeding the Owner's operations and grading these areas, as shown on the Plans, specified in these Special Provisions and as directed by the Engineer shall be included in the unit prices paid for the various items of work and no additional compensation will be allowed therefor.

19-4.03 STAGING AREA

The Contractor shall utilize the area designated on the Plans as the Staging Area in accordance with these Special Provisions and as directed by the Engineer.

The Contractor may park construction equipment and may stage construction materials within the area designated on the Plans as the Staging Area.

The Contractor is hereby informed that, although the perimeter of the landfill site is fenced, the Staging Area is not separately fenced or otherwise secured. The Contractor may elect to install temporary fences to secure the Staging Area in accordance with these Special Provisions. The Contractor will be solely responsible for any costs incurred from damage to or loss of equipment or materials due to theft or vandalism, and no additional compensation will be allowed therefor.

The Contractor shall, prior to project completion, restore the Staging Area to its original configuration as directed by the Engineer. Any damage to any existing facilities which was caused by the Contractor or the Contractor's subcontractors shall be repaired by the Contractor at the Contractor's expense.

Full compensation for providing all labor, material, equipment, and incidentals and for doing all the work involved in staging equipment or materials in the designated Staging Area, restoring the area to its original configuration, repairing any damage caused by the Contractor or the Contractor's subcontractors, and any other work necessary, as shown on the Plans, specified in these Special Provisions and as directed by the Engineer shall be included in the unit prices paid for the various items of work and no additional compensation will be allowed therefor.

19-4.04 SELECTED MATERIAL STOCKPILE AREA

The Contractor shall designate an area within Permanent Stockpile Area as the Selected Material Stockpile Area in accordance with these Special Provisions and as directed by the Engineer. The designated area for the Selected Material Stockpile Area must be shown on a layout plan submittal. The location of the designated area for the Selected Material Stockpile Area must be approved by the Engineer prior to the start of construction.

The Selected Material Stockpile Area is not labeled on the plans, but is bounded to the west of Fill Area III as shown on the plans and must be within the limits of Permanent Stockpile Area. Selected sandy soil from the excavation to be used for the construction of the operations layer shall be stockpiled in the Contractor's designated area of either Permanent Stockpile Area . Additionally, at the Contractor's option and expense, additional selected sandy soil materials in excess of those needed for construction of the operations layer generated from excavation may be placed therein.

No materials other than those expressly approved by the Engineer as selected sandy soil shall be placed within the designated area. In the event the Contractor places materials therein without the approval of the Engineer, such materials shall be removed therefrom and transported to and placed in a non-designated area within the limits of Permanent Stockpile Area at the Contractor's expense.

Full compensation for providing all labor, material, equipment and incidentals and for doing all the work involved in transporting and placing selected material in the designated Selected Material Stockpile Area, removing and transporting such material for use in construction of the operations layer, removing any materials placed therein without the express approval of the Engineer and transporting and placing such materials in Permanent Stockpile Area , as shown on the Plans, specified in these Special Provisions, as directed by the Engineer and without interfering with the Owner's ongoing operations, shall be included in the unit prices paid for the various items of work and no additional compensation will be allowed therefor.

19-4.05 PERMEABLE MATERIAL

Permeable material shall be clean, washed, water worn gravel conforming to the provisions in Section 68-2.02F of the Standard Specifications and these Special Provisions, and shall have a minimum permeability of 1 cm/sec.

Permeability shall be tested by the County's material testing laboratory at a frequency of one test per 1,000

cubic yards. Any material not passing the permeability test or otherwise not in conformance with the requirements of these Special Provisions shall be rejected and shall be replaced by the Contractor at no additional cost to Owner.

The permeable material shall be Class 1, Type A. No crushed rock will be allowed. Permeable material shall be placed using equipment and methods that will not damage the Geomembrane. Trucks, tractors or other equipment traveling on the permeable material shall not exceed the maximum allowable equipment ground pressures listed in the chart below.

The methods to be used in placing the permeable material shall be approved in writing by the liner material installer and the Engineer prior to placement of the permeable material. The Contractor shall submit a written plan for the placement of the permeable material for approval at least 10 days in advance of the Contractor's proposed starting date. The Contractor shall comply with the maximum allowable equipment ground pressures listed in the following table:

Maximum Allowable Equipment Ground Pressure (psi)	Thickness of Permeable Material Over Geosynthetics (feet)
5	1.0
10	1.5
15	2.0
>20	3.0

It is necessary for the permeable material to contain some moisture to facilitate the geoelectric leak location survey. The Contractor shall be responsible for ensuring that sufficient moisture is present in the permeable material to perform the geoelectric leak location survey.

For the entire duration of the contract, the Contractor shall, as often as necessary as directed by the Engineer, remove and dispose of any excess water which has collected in the sump or elsewhere within Modules 9 & 10. The Contractor shall be responsible for maintaining the sump and Modules 9 & 10 and for pumping out any water which collects in the sump or elsewhere within Modules 9 & 10, regardless of the source of said water.

After the permeable material has been placed, the Contractor shall maintain it free of ruts, depressions, and damage resulting from the hauling and handling of any material, equipment, tools, etc. until such time as the overlying materials are placed.

The Contractor shall use all means necessary to protect all prior work, including all materials and completed work of other sections.

In the event of damage, the Contractor shall immediately make all repairs and replacements necessary, to the approval of the Engineer and at no additional cost to the Owner.

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

19-4.06 WINTER PAD

19-4.06.1 GENERAL – The winter pad shall consist of native materials that shall be placed over the Operations layer in accordance with methods prescribed by these Special Provisions and as directed by the Engineer.

19-4.06.2 MATERIAL - Material, as identified by the Engineer, from the excavation of Modules 9 & 10, shall be used to construct the Winter pad. The material shall be free of rocks, roots, or any other material or objects.

19-4.06.3 PLACEMENT - The methods to be used in placing the Winter Pad shall be approved in writing by the Engineer.

The winter pad shall be placed in layers with a minimum thickness of one foot unless otherwise allowed by the Engineer.

The Winter pad shall be placed and compacted in lifts to 90% relative compaction in each lift

The surface of the winter pad shall be graded and rolled to provide a smooth uniform surface and shall not vary more than 0.1 foot from the grade established by the Engineer at any point.

19-4.06.4 MEASUREMENT AND PAYMENT

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

Replace Section 19-6.02A GENERAL with:

Embankment material for Access roads:

A. Sources: On-site stockpiles or borrow excavations from Module 9 & 10 excavation.

B. Consists of clean, non-expansive silty sand (SM), clayey sand (SC), or mixtures thereof as approved by the Engineer. Plasticity index less than 15

C. Maximum particle size of 3 inches.

20 LANDSCAPE

Replace Section 20-1.02B with:

20-1.02B Water

Make arrangements for supplying water. Water must be of a quality that promotes plant growth.

21 EROSION CONTROL

Replace Section 21-2.01C(4) with:

21-2.01C(4) Tackifier

Submit a certificate of compliance for tackifier and bonded fiber matrix at least 5 business days before application. Certificates of compliance must include:

1. SDS
2. Product label
3. List of applicable nonvisible pollutant indicators for soil amendment and stabilization materials as shown in the table titled "Pollutant Testing Guidance Table" in the Caltrans *Construction Site Monitoring Program Guidance Manual.* For the manual, go to the Caltrans Division of Construction website
4. Report of acute and chronic toxicity tests on aquatic organisms complying with EPA methods
5. List of ingredients, including chemical formulation
6. Properties of polyacrylamide in tackifier including:

6.1. Percent purity by weight
6.2. Percent active content
6.3. Average molecular weight

6.4. Charge density

Add to Section 21-2.02P:

3. 20-inch in diameter and at least at least 11 lb/ft with a minimum functional longevity of 1-year.

Add to Section 21-2.02R:

Anchor Posts: Use 1-inch by 1-inch wooden stakes, minimum length 24 inches for 8-inch diameter straw wattle and 36 inches for 20 inch diameter straw wattle.

Add to Section 21-2.03P:

Install 20 inch straw wattles along the edge of the access road as shown on plans. Straw Wattles shall be anchored using 36-inch long wooden stakes positioned on 4-foot centers along the length of the wattle. Stakes shall be driven through approximately one-third of the wattle thickness on the ground. Wooden stakes shall be driven to within 1-inch of top of wattles

26 AGGREAGATE BASES

Add to Section 26-1.02A GENERAL:

21-2.01C(4) Tackifier

Submit a certificate of compliance for tackifier and bonded fiber matrix at least 5 business days before application. Certificates of compliance must include:

Aggregate base shall be ¾ inch gradation

DIVISION VIII MISCELLANEOUS CONSTRUCTION

78 INCIDENTAL CONSTRUCTION

Add the Following to Section 78-2

Damaged or destroyed survey monuments shall be replaced with new survey monuments.

Survey monuments shall be constructed or adjusted, as applicable, in accordance with Standard Drawing A-74 Type D.

Survey control for the reestablishment of survey monuments will be provided by the Department.

Add Section 80-4 TEMPORARY FENCES

The Contractor shall furnish, construct and install temporary fences in accordance with these Special Provisions and as directed by the Engineer.
Temporary fences may be furnished, constructed and maintained by the Contractor in the event that the Contractor wishes to secure the equipment and/or materials staging areas.
If the Contractor elects to install temporary fences to secure the equipment and/or materials staging area, the Contractor shall submit a layout plan to the Engineer and shall not commence with installation of temporary fences until said plan has been approved by the Engineer.
Temporary fences shall be removed from the site when they are no longer needed by the Contractor, and shall remain the property of the Contractor.

Except as otherwise specified in this section, temporary fences shall conform to the plan details and the specifications for permanent fences of similar character as provided in Section 80, "Fences," of the Standard Specifications.
Used materials may be utilized providing such materials are good, sound, and are suitable for the purpose intended.
Concrete footings for metal or wood posts will not be required for temporary fences.
Temporary fences that are damaged from any cause during the progress of the work shall be repaired or replaced by the Contractor at the Contractor's expense.
When no longer required for the work as determined by the Engineer, temporary fences shall be removed. Removed facilities shall become the property of the Contractor and shall be removed from the site of the work, except as otherwise provided in this section.
Removed temporary fence materials that are not damaged may be reused in the permanent work providing such materials conform to all of the requirements specified for the permanent work and such materials are new when used for the temporary fences.
Holes caused by the removal of temporary fences shall be backfilled in accordance with the provisions in the second paragraph of Section 15-1.02, "Preservation of Property," of the Standard Specifications.
Full compensation for installing, maintaining, removing, and disposing of temporary fences, shall be considered as included in contract prices paid for the various items of work and no additional compensation will be allowed therefor.

DIVISION IX TRAFFIC CONTROL DEVICES

82 SIGNS AND MARKERS

Replace Section 82-1.01A with:

82-1.01A Summary

Section 82-1 includes general specifications for fabricating and installing sign panels and markers and constructing roadside signs.

Signs and markers must comply with the *California MUTCD*, *California Sign Specifications,* and the FHWA publication *Standard Highway Signs and Markings*. For the *California Sign Specifications*, go to the Caltrans Traffic Operations website.

Replace Item 1 of the 2nd paragraph of section 82-2.02A with:

1. Phrase *Property of The County of Fresno*

Add to section 82-2.02B:

Signs must be 0.080 inch thick aluminum alloy and street name signs must be 0.125 inch thick alloy faced on both sides.

Add to section 82-2.02C:

Reflective sheeting on all signs shall be 3M Diamond Grade DG3 Series 4000 or equal and must meet ASTM Type XI specifications.

Add to section 82-2.02D:

All signs must have the 3M 1160 graffiti resistant clear overlay film or equal.

Replace Section 82-2.04 with:

82-2.04 PAYMENT Not Used

Add to section 82-3.02A:

All new roadside signs must be square post 14 gauge steel.

Add to section 82-3.02B:

All post for traffic signs must be 2”X2”X10’ square by 14 gauge steel, with 7/16 inch holes punched one inch on center on all four sides for the entire length of the post.

Welded Anchor (2 ¼”X2 ¼”X30”) and sleeve (2 ½”X2 ½”X18”) shell be used as a base to anchor post in the ground. Hole size and placement must be the same as the metal post.

All mounting hardware shall be either galvanized or stainless steel. Banding shall be 3/4 inch wide stainless steel with flare leg sign brackets. Hose clamps are not permitted. All signs shall be mounted using 3/8” aluminum drive rivets. Nuts and bolts are not permitted.

Replace item 1 in the list in the 2nd paragraph of section 83-2.02C(1)(a) with:

1. Wood line posts.

Replace item 2 in the list in the 2nd paragraph of section 83-2.02C(1)(a) with:

2. Wood blocks for line posts.

Replace Section 82-3.02D with:

82-3.02D Laminated Wood Box Posts

Furnish a laminated wood box post with an attached metal cap at the top of each post.

Replace the last line of section 82-3.04 with:

Full compensation for furnishing sign panels is included in the bid item price per each Roadside Sign - One Post and Roadside Sign - Two Post. One or more sign panels furnished and installed on a single post will be counted as (1) one Roadside Sign - One Post. One or more sign panels furnished and installed on two posts will be counted as (1) one Roadside Sign - Two Post.

84 MARKINGS

Add to Section 84-1.03

Before obliterating any pavement delineation (traffic stripes, pavement markings) that is to be replaced on the same alignment and location, as determined by the Engineer, the pavement delineation shall be referenced by the Contractor, with a sufficient number of control points to reestablish the alignment and location of the new pavement delineation. The references shall include the limits or changes in striping pattern, including one- and 2-way barrier lines, limit lines, crosswalks and other pavement markings. Full compensation for referencing existing pavement delineation shall be considered as included in the contract prices paid for various items of work and no additional compensation will be allowed.

The Contractor shall protect pedestrian crosswalks, stop bars, rumble bars, and rumble Botts’ dots from damage or displacement, unless otherwise directed by the Engineer.

Replace or repair facilities, which are damaged with your operation, at your expense.

Add to the end of item 2 in the list in the 1st paragraph of Section 84-2.01C:

, except for thermoplastic

Add between the 1st and 2nd paragraphs of section 84-2.01C:

For each lot or batch of thermoplastic, submit a manufacturer's certificate of compliance with test results for the tests specified in section 84-2.01D. The date of test must be within 1 year of use.

Add to the end of section 84-2.01D:

Each lot or batch of thermoplastic must be tested under California Test 423 for:

1. Brookfield Thermosel viscosity
2. Hardness
3. Yellowness index, white only
4. Daytime luminance factor

5. Yellow color, yellow only
6. Glass bead content
7. Binder content

During the installation of thermoplastic traffic stripes or markings at the job site, apply a test stripe of the thermoplastic on suitable material in the presence of the Engineer. The test stripe must be at least 1 foot in length. The test stripe will be tested for yellow color, daytime luminance factor, and yellowness index requirements.

Delete the 1st paragraph of Section 84-2.03C(2)(a)

Replace the 2nd paragraph of section 84-2.03C(2)(b) with:

Apply extruded thermoplastic for a traffic stripe at a rate of at least 0.37 lb of thermoplastic per foot of 4-inch-wide solid stripe. The applied thermoplastic traffic stripe must be at least 0.100 inch thick.

Replace Section 84-2.03C(2)(c) with:

Apply sprayable thermoplastic under State Specification PTH-02SPRAY at a temperature from 350 to 400 degrees F.

Apply sprayable thermoplastic at a rate of at least 0.22 lb of thermoplastic per foot of 4-inch-wide solid stripe.

The applied sprayable thermoplastic material must be 0.08 inch (80 mil) thick.

Replace *Reserved* in section 84-9.03C with:

Residue from the removal of painted or thermoplastic traffic stripes and pavement markings contains lead from the paint or thermoplastic. The average lead concentrations are less than 1,000 mg/kg total lead and 5 mg/L soluble lead. This residue:

1. Is a nonhazardous waste
2. Does not contain heavy metals in concentrations exceeding the thresholds established by the Health and Safety Code and 22 CA Code of Regs
3. Is not regulated under the Federal Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 et seq.

Management of this material exposes workers to health hazards that must be addressed in your lead compliance plan.

DIVISION X ELECTRICAL WORK

86 BASIC ELECTRICAL REQUIREMENTS

PART I. GENERAL

1.1 WORK INCLUDED

A. The work described in this section consists of furnishing all labor, materials, equipment, and installation required for the complete, satisfactory, and approved electrical systems as indicated on the Contract Drawings and called for in these Specifications, or as may be reasonably implied by either. The work shall include fabrication, installation and integration of two Sump Pump Control Panels for Modules 9 & 10, at Phase III of the American Avenue Disposal Site, as shown on the Contract Drawings and Specifications herein.

B. The Contractor shall provide, fabricate, factory test and program Sump Control Panels for Modules 9 & 10. Complete with necessary devices, instruments and the like for power, control, and telemetering of sumps as shown on the Contract Drawings. Deliver all Sump Control Panels to site, ready for installation and connection. Engineer will inspect Sump Control Panels for completion of installation in Phase III, Modules 9 & 10.

C. The Contractor shall furnish and install complete and operating electrical systems consisting of the following:

1. Sump Control Panels for Modules 9 &10. Complete with necessary devices, instruments and the like for power, control, and telemetering of sumps as required at each module and shown on the Contract Drawings.
2. Connect new control panels to new wire, new grounds and all other items as shown on the Contract Drawings.
3. Programing and functionality testing of new control panel PLC and HMI touch screen and integration of new control panel telemetering with existing SCADA system to be performed by the County.
4. Connect electrical to new specified flow meters.
5. Provide and install new sump pumps, sump pump cables, sump level sensors, cable termination junction boxes and other as specified and connect.
6. Contractor shall make all final connections to equipment.
7. Contractor shall provide radios, antennae and cable connections as shown. Antennae cables shall enter the panels through the bottom of the enclosures and be provided with drip loops.

1.2 CODES AND STANDARDS

A. Reference within these Specifications to standards, codes, or reference specifications implies that any item, product, or material so identified must comply with all minimum requirements as stated therein, unless indicated otherwise. Only the latest revised editions, adopted by local governing agencies, are applicable.

B. The Specifications, codes, and standards listed below form a part of these Specifications:

1. National Electrical Code (NEC).
2. Underwriters' Laboratories (UL).
3. National Electrical Manufacturers Association (NEMA).

4. Insulated Cable Engineers Association (ICEA).
5. American Society for Testing and Materials (ASTM).
6. California Electrical Code (CEC)
7. Instrument Society of America (ISA)
8. County of Fresno Standard Special Provisions
9. Caltrans Standard Specifications, 2010, as amended

C. Testing and Laboratory Listing/Approval: Equipment and material shall be UL listed where standards have been established, and shall be identified for the purpose intended.

1.3 DRAWINGS

A. The Contract Drawings indicate the extent and general arrangements of equipment and wiring systems. If any modifications from the drawings are deemed necessary by the Contractor, details of such modifications and reasons therefor shall be submitted to the Engineer for approval within 30 days after award of the Contract. No such modifications shall be made without the prior written approval of the Engineer. All items not specifically mentioned in the Specifications or noted on the drawings but obviously necessary to make a complete working installation shall be included.

1.4 SUBMITTALS

A. Shop Drawings:

1. Each package of shop drawings shall be bound as a unit and shall contain a first sheet with the project name, location, date submitted, name and address of the contractor, name and address of the equipment supplier, and a list of the contents.

2. The submittal drawings shall include materials, dimensions, fabrication details, installation instructions, standards compliance, and UL approval. Where a data sheet contains details covering various sizes or ratings of equipment, clearly mark the items applicable to the project.

3. Submit drawings for pull box, conduit and fittings showing dimensions, nameplate nomenclature and electrical rating.

B. Operation and Maintenance Manuals:

1. The operation and maintenance manuals shall include the name, address, and phone number of the supplier and nearest manufacturer's representative and shall contain a complete parts list for each system.

1.5 EQUIPMENT MANUALS AND OWNER INSTRUCTIONS

A. Upon completion of the work, the Contractor shall prepare and deliver to the Engineer five complete sets of the operation and maintenance manuals for each electrical, control, or similar equipment installed. The manuals shall consist of detailed drawings of catalog sheets for each component, replacement parts lists, wiring diagrams, maintenance instructions, and description of system operation.

1.6 COORDINATION WITH OTHER TRADES

A. The Contractor shall plan and layout the electrical work in order to be compatible with the site, equipment location, and panel mounting.

1.7 STORAGE

A. All materials shall be stored in a safe, orderly manner. Materials shall not be stored directly on the ground or floor and shall be kept clean, dry, and free from damage or deteriorating elements. Damaged or rusted materials shall not be installed.

1.8 MATERIALS

A. All equipment, materials, and components shall be new, standard, current products by manufacturers regularly engaged in the production of such equipment and be the manufacturer's latest design. All components by same manufacturer shall be mechanically and electrically compatible witl1 rating of apparatus in which they are installed. All materials shall bear the label of Underwriters Laboratory for the intended use in all cases where this labeling is available or shall be materials reviewed by the code enforcing authorities and Engineer. Equipment of a similar nature shall be identical.

1.9 ACCESSORIES

A. All hardware and accessory fittings shall be of a type designed, intended, or appropriate for their use, complement the items with which they are used, and shall have corrosion protection suitable for the atmosphere in which they are installed. All such hardware shall be U.S. standard sizes.

1.10 INSTALLATION

A. All materials shall be installed at the locations shown on the drawings and in accordance with the specific manufacturer's recommend installation methods.

B. All equipment shall be set level and plumb at the correct heights, properly aligned, and, where in sections, shall be bolted together.

C. Secure all materials and equipment firmly in place. Do not weld electrical materials for attachment and/or support.

D. All screws, bolts, nuts, clamps, fittings, or other fastening devices shall be made up tight.

E. All materials and equipment shall be installed complete, including screws or bolts, covers, plates, fittings, etc.

F. Follow the installation directions and recommendations of the materials and equipment manufacturers.

G. All conduits stub-ups from underground shall be provided with conduit seal- off prior to terminating to electrical equipment, devices, and wire trough. Connections to motors shall be made with metallic flexible metal conduit and approved fittings.

1.11 IDENTIFICATION

A. Electrical equipment shall be clearly and permanently labeled with a securely fastened nameplate. Nameplates shall be 1/16-inch thick engraved laminated plastic and shall have 3/16-inch high white letters on a black background. Plates shall be provided for all fused disconnect, control panel, and circuit breaker panels.

B. All conductors shall be permanently tagged at wire trough and terminal boxes. Feeders shall be identified at every accessible point with a permanent tag indicating circuit number. Conductor tags shall be non-conductive.

C. All circuits and equipment shall be identified to correspond with drawings and specifications.

D. Panel board shall contain a typewritten directory behind a plastic cover, located on inside of door.

E. Install equipment identification nameplate at the top center of the equipment, using a rubber-based adhesive.

1.12 CONNECTION

A. Make all connections for the power distribution and control devices. Install and connect pump motor starters and controls for correction operation, including exact wiring requirements as determined in accordance with control wiring diagrams furnished for the equipment.

B. Contractor shall submit work plan listing all likely service interruptions, the affected locations, and their durations for Owner approval. Contractor shall coordinate scheduling of every interruption with Owner prior to starting work.

1.13 TESTING

A. Upon completion of the work, the Contractor shall energize, start up, and test operate all the systems and equipment in the presence of the Engineer and Owner.

B. All testing and measuring instruments and equipment required to test each system shall be provided by the Contractor. Any defects or variances from standard or specified conditions found during these tests shall be corrected by the Contractor at no cost to the Owner. The following tests shall be performed:

1. The main service and all feeders and branch circuits shall be energized from the normal power source. Amp meter and volt meter readings shall be made and recorded as follows: Phase to phase and phase to ground voltage at the main service connection at motor starters or and panel board.
2. All circuit breakers shall be manually tripped and reset.
3. All defective equipment and/or components found during test shall be immediately replaced.
4. All motors and controls shall be checked to verify correct connection and operation.
5. A complete operating test of the instrumentation and control systems shall be made to verify correct operation of each system and all related equipment.

C. Prior to the final test, continuity tests and insulation resistance tests shall be performed to assure there are no shorts or unintentional grounds in the entire electrical system. Test reading shall be recorded and given to the Engineer.

1.14 PERSONNEL AND EQUIPMENT

A. The Contractor shall provide the following:

1. Qualified personnel to conduct all testing.
2. The services of the equipment manufacturer's representative to assist in testing their equipment, when the service is specified.
3. The services of the equipment manufacturer's representative to assist the Contractor in the repair or troubleshooting of their equipment in the event that said equipment fails to pass all tests.
4. All labor and equipment required for testing.

1.15 CLEAN-UP AND PAINTING

A. After all systems and equipment have been installed, the Contractor shall clean all electrical equipment inside and outside the enclosures. All grease, dust, rust, and chipped plaster and concrete shall be removed from the installed equipment. Each piece of equipment shall be thoroughly cleaned and left in brand new condition. The project will not be accepted as being finished until all such dirt and contamination has been removed. The Contractor shall provide touch-up painting where finished surfaces have received minor scratches during installation. Where electrical equipment with painted surfaces has been installed in finished areas, any such damage to the painted surfaces that cannot be corrected with minor touch-up painting shall be refinished at the factory at no cost to the Owner. Equipment installed in finished areas having noticeable damage to the finished surface will not be accepted.

PART 2. PRODUCTS (NOT USED)

PART 3. EXECUTION (NOT USED)

END OF SECTION

86-1 WIRES, CABLES AND CONNECTIONS

PART I. GENERAL

1.1 WORK INCLUDED

A. The work included in this section covers the work necessary to furnish and install wires, cables, and connectors for electrical and control circuits as shown on the drawings and specified herein.

1.2 STANDARDS

A. Materials to bear UL labels.

1.3 SUBMITTALS

A. Submit for review properly identified manufacturer's literature and shop drawings giving wire size, insulation type, rated voltage and temperature, and NEC designation.

PART 2. PRODUCTS

2.1 MATERIALS

A. Power Conductors (Above 50 Volts and Below 600 Volts):

1 Conductors shall be rated at 600 volts and conform to NEMA WC-7.

2. Conductors shall be composed of 98 percent annealed copper only, stranded. Furnish conductor sizes for circuits as shown on Project Drawings. Minimum size shall be #12 AWG except as otherwise specified for control wiring.
3. All conductors shall be 600 volt minimum, type THWN, rated 75 degrees C wet or dry maximum conductor temperature with polyvinyl chloride insulation, and shall comply with UL standard for thermoplastic insulated wire.
4. All conductors shall be plainly marked on outer surface at least every two feet with name of manufacturer, and size and grade of insulation.
5. Multiple conductors in the same conduit shall be considered to be a bundle.
6. Conductors and cables exposed to sun, weather and ground contact shall be rated sunlight or UV resistant, approved for wet locations, flexible and abrasion resistant.

B. Color code all service, feeder, and branch circuit wire as follows:

1. 277/480 Volt System:
   i. Light Gray - Neutral;
   ii. Brown -Phase A;
   iii. Orange - Phase B;
   iv. Yellow - Phase C.
2. Bonding conductor - green.
3. Solid colored insulation shall be used on all conductors #10 AWG and smaller and colored vinyl tape banding over black insulation at all accessible locations for #8 AWG and larger.

C. Control Wiring:
   1. All control wiring conductors shall be 600 volt type THWN. Minimum size shall be #14AWG.
   2. Control panel wiring shall be type MTW or as indicated on drawings. Minimum size as indicated on drawings.
   3. Conductors for control wiring shall be color coded, using color coding different than for the power conductors specified above.

D. Instrumentation Wiring:
   1. All instrumentation wires shall be soft annealed bare or tinned copper with PVC flame retardant insulation, 300 volt rating except 600 volt rating when installed in enclosures and/or raceways containing 480 volt operating voltage, I 05°C temperature rating, overall cable shield and with a drain wire. All instrumentation wires shall be minimum as indicated on drawings.
   2. Instrument cables exposed to the sun, weather and ground contact shall be rated sunlight or UV resistant, approved for wet locations, flexible and abrasion resistant.

E. Connectors, Terminals, and Splices:
   1. Provide connectors, terminals, and splices for all power and lighting circuits using 600-volt wire and cable as follows:
      a. Provide connectors, terminals, and splices, for all wire, cable, and equipment and bus connections that are designed and approved for the specific type and size of conductors being connected.
      b. Connectors and terminals shall be designed and UL-approved for use with the associated conductor material and shall provide a uniform compression over the entire contact surface. Solderless terminal lugs shall be used on all stranded conductors.
      c. Pressure-crimp type connectors, terminals, and splices shall be applied with a mechanical or hydraulic tool with proper size crimping dies for making each connection. The tool shall be of the type that will not release until the correct pressure has been applied.

PART 3. EXECUTION

3.1 INSTALLATION

A. Conductors shall not be pulled into conduit until all mechanical work is complete and , conduits have been swabbed and are free of any dirt or debris.

B. Pulling lubricants shall be of the type accepted for the particular cable insulation and as recommended by the cable manufacturer.

C. Conductors in panel boards, junction boxes, pull boxes, etc., shall be formed, grouped, and cable tied to present a neat and orderly appearance.

D. Leading end of each conductor pulled shall be carefully examined for damage to jacket. If damaged, cable shall be extended and further checked for damage with only good cable to remain.

E. At each outlet, allow not less than 6 inches of slack for connection to load.

F. Tape all connections in 600-volt wire and cable as follows:
   1. Tape all connections, splices, taps, and exposed barrels of terminal lugs with half-lapped layers of 3M Scotch 33, vinyl plastic tape, or equal, applied to a thickness

equal to the conductor insulation and, in addition, apply at least two half-lapped layers of 3M Scotch 88 vinyl plastic tape over the first layers of tape.

G. Wire and Cable Marking:
1. The convention for identifying and numbering all wires shall be consistent with the existing marking system in Phase III, Modules 1, 2 and 3.
2. Identify each phase of all three phase feeder conductors with 3M Scotch 35, or equal, vinyl plastic markingtape.
3. All feeders and branch circuit conductors and all control, alarm, and instrumentation wires shall be identified at all terminations, junction boxes, and pull boxes as follows:
   a. Use Brady Company, or equal, self-sticking vinyl cloth wire markers for all wire and cable identification.
   b. Identify all conductors of control, alarm, and instrumentation systems with wire numbers or terminal letters as indicated on the drawings. Where markings are not indicated, the Contractor shall assign his own markings and indicate them on the "Record Drawings" set of Project Drawings.

H. Installation of 600-volt Wire and Cable:
1. Install wire and cable in conduits and other enclosures as indicated on Project Drawings. Except as otherwise indicated or specified, all wire and cable shall be installed in continuous runs between terminal points without splicing.
2. Make splices and taps only in wire trough from terminals in terminal boxes and other accessible enclosures.
3. Do not splice or tap control, alarm, or instrumentation wiring in underground locations.
4. When pulling wire or cable, do not subject the wire or cable to a tension greater than 50 percent of the yield strength of the conductor. Pulling lugs shall be attached to the conductor with a sleeve or grip over the cable sheath to prevent the insulation from slipping.
5. Use a UL-approved lubricant to decrease friction when pulling cable in ducts and conduits.
6. Do not subject cable to a bending radius less than 8 times the cable's outside diameter during or after installation.
7. In wire trough, make splices first then encapsulate them in an epoxy resin sealing and potting compound. Encapsulation of compression sleeve splices shall be with preformed molds.
8. Pulling of wires and cable into conduits shall be performed by workers experienced in this type of work and shall be done in a manner which will in no way damage the insulation.
9. Sufficient lengths (minimum of three-feet) of wire shall be left at pull boxes for splicing and/or connecting to equipment and apparatus without straining.
10. All conductors and cables to be installed in a single conduit shall be pulled at the same time.

I. Wire Sizes. Drawings indicate wire and conduit sizes. Any changes shall be approved by the Engineer.

J. Terminations:
1. Terminate solid conductors at screw terminals or mechanical connectors furnished on devices and equipment.
2. Terminate stranded conductors at mechanical connectors furnished on equipment. Where no connectors are included, provide suitable mechanical connectors.
3. Termination of stranded conductors on screw terminals will not be permitted. Provide suitable size compression or mechanical-type connector with spade tongue.

3.2 TESTING

A. Continuity tests and insulation-resistance tests shall be performed to assure there are no shorts or unintentional grounds. The insulation resistance shall be measured with a 2500-volt DC megger at twice the conductor voltage and should read greater than 50 megohm (conductor to conductor and conductor to ground). Test readings shall be recorded and a certified copy given to the Engineer.

END OFSECTION

86-2 GROUNDING

PART 1. GENERAL

1.1 WORK INCLUDED

A. The work included in this Section covers the work necessary to provide a grounding system complete as indicated on the Project Drawings and specified herein.

1.2 QUALITY ASSURANCE

A. Materials shall bear UL label.

B. The electrical system and equipment shall be grounded in accordance with the requirements of the NEC and as specified.

C. Grounding system installation shall conform to NFPA 70 and the NEC.

D. Grounding system shall be installed as shown on drawings.

E. Install in all conduit runs an insulated, green equipment grounding conductor and bond in accordance with the NEC.

PART 2. PRODUCTS

2.1 MATERIALS

A. The grounding conductor shall be an insulated copper wire of size indicated. Where not indicated, the conductor shall be in accordance with the requirements of the NEC except that minimum size shall be No. 12. Inaccessible connections shall be made with the exothermic welding process using equipment manufactured by Burndy or Erico Products. Accessible connections shall be made with multiple bolt silicon bronze connectors specifically designed and approved for the connection to be made. Connectors shall be as manufactured by Burndy or O.Z. Gedney Electric. Grounding jumpers shall be provided across metal parts which are separated by non-conducting materials or joined so that there is a low resistance at the joints. Grounding cable shall not be buried directly in concrete, but a conduit sleeve shall be provided where cable passes through concrete. Grounding cable buried in earth shall be tinned.

B. Grounding Source:

1. The ground source shall consist of existing ground rods, grids, and other existing ground sources except as noted below.

2. Maximum resistance to ground shall be 1 ohm. Additional ground rods shall be driven if required to maintain this level.

3. Verify locations of utilities and liner with Engineer prior to installation of grounding rods.

C. Ground Rods. Unless as specified on the Project Drawings, copper clad steel rod shall be not less than 3/4 inch in diameter, 10 feet long, driven full length into the earth. Maximum ground resistance shall not exceed 25 ohms under normal dry conditions. Verify locations of utilities and liner prior to installation of grounding walls. Test grounding resistance using a “fall of potential/3-point” grounding electrode testing meter.

D. Parts to be grounded. Parts to be grounded include fences, disconnect switch frame, frame,

fittings, fixtures and devices, cable sheaths, neutral of transformers, wire trough and raceways, motor frames, skid frame, and devices, and all other parts and equipment as required by NEC. Neutral wire shall never be used as grounding means.

E. Conductor. All grounding conductors shall be green insulated copper stranded cable, soft drawn or annealed, sized as indicated on drawings. Bare copper grounding conductors may be used when encased in concrete or buried below grade.

PART 3. EXECUTION

3.1 INSTALLATION

A. All connections to equipment, bus, or conduit shall be made with approved type of solderless connector and shall be unpainted and thoroughly cleaned before connection is made to insure a good metal contact.

B. All connections which will be inaccessible after completion of project shall be made by exothermic weld process.

C. The lighting fixture shall be grounded by means of a conductor between the outlet box and fixture. All enclosures, junction boxes and panels shall be grounded with a grounding conductor that is continuous to the electrical service main bonding jumper. Conduits connecting to enclosures using concentric knockouts, are 2" in diameter or larger, or on a 480/277 volt system shall be bonded by using a grounding hub. All conduit connections to cabinets, pull boxes, junction boxes, etc., shall be drawn up sufficiently tight to assure a continuous metal- to-metal bond.

D. Bond all conduits stubbing under motor starter panels, wire trough, motor control center, and similar locations using bonding bushings.

E. Provide a bonding wire in all flexible conduits and connect to the boxes at each end in an approved manner.

F. Flexible conduit shall not be used as a grounding medium.

G. Ground receptacles to their outlet boxes by means of a grounding conductor from the green terminal on the receptacle to a grounding screw in the outlet box.

H. Ground the neutral of each dry type transformer. It shall be bonded with the grounding conductor that is continuous to the electric service, and shall be grounded to the enclosure housing the transformer. The main bonding jumper (transformer secondary side neutral-ground connection) shall provide the grounding conductor for the transformer loads..

END OF SECTION

86-3 RACEWAYS

PART I. GENERAL

1.1 WORK INCLUDED

A. The work included in this Section covers the work necessary to furnish and install raceways for electrical and control wiring as shown on the drawings and specified herein.

1.2 STANDARDS

A. Size of raceways shall be not less than NEC requirements, but in no case shall be less than indicated on the drawings. Project Drawings are diagrammatic and routing of conduits shall be made by the Contractor to avoid interference with other work.

B. Materials shall bear UL labels.

1.3 RELATED WORK

A. Section 86 – Basic Electrical Requirements.

1.4 SHOP DRAWINGS

A. Submit for review properly identified manufacturer's literature and shop drawings giving materials, finishes, dimensions, weights, and standards compliance.

PART 2. PRODUCTS

2.1 MATERIALS

A. Rigid Steel Conduit. Use rigid steel conduit for aboveground, including bushings, couplings, elbows, nipples, and other fittings, galvanized by hot-dipping, and meeting the requirements of UL and NEC. All conduit connections shall be threaded, Do not use set screw-type or compression couplings, bushings, elbows, nipples, and other fittings, unless approved by the Engineer. All below grade to above grade transitions shall be rigid steel conduit with a minimum of three feet of rigid steel conduit below grade. Below grade rigid steel conduit shall be PVC jacketed, or double half-lap 20 mil conduit wrap. All below grade rigid steel conduit couplings and fittings shall be double half-lap 20 mil conduit wrap wrapped, to include PVC adapter connections.

B. PVC Conduit. Use PVC conduit, elbows, couplings, for underground direct burial meeting the requirements of UL and NEC. Conduit size and schedule shall be as shown on plans. Conduit color shall be grey with labeling as required per UL and NEC.

C. Flexible Metal Conduit, Liquid-tight. Unless as noted on the drawings at pump motors and field mounted devices, use UL listed liquid-tight flexible metal conduit consisting of galvanized steel flexible conduit covered with an extruded PVC jacket and terminated with nylon bushings or bushings with steel, or malleable iron body and insulated throat and sealing 0-ring (approved metallic liquid-tight flexible connectors).

D. Conduit Sealing Fittings. Unless noted otherwise on the Project Drawings, the Contractor shall use EYD conduit sealing fittings consisting of body and closure made of ferraloy or malleable iron with zinc electroplate finishes and removable nipple made of steel with zinc electroplate finishes.

E. Sealing Compound. Material shall maintain its dimension and integrity while preventing the passage of flame and gases under conditions of installation and use when exposed to the ASTM El 19 time-temperature curve for a time period equivalent to the rating of the assembly penetrated.

PART 3. EXECUTION

3.1 INSTALLATION

A. Changes in directions of raceway runs shall be made with symmetrical bends or cast metal fittings. Field-made bends and offsets shall be made with a hickey or conduit bending machine specifically for size and type of conduit used. Minimum radius shall be 8 times conduit diameter for rigid metal conduit and PVC jacketed rigid metal conduit. Crushed or deformed raceways shall not be used. Use factory formed fittings for surface raceways.

B. Except where boxes, panels, and other equipment have threaded openings, make conduit connections with malleable or diecast conduit hubs. Where conduit bonding is required use conduit hubs with bonding lugs. :

C. Location and Use of Each Type of Conduit:

1. Galvanized rigid steel conduit shall be used:

   a. When installed aboveground.

2. PVC conduit shall be used:

   a. When installed underground.

   b. Trenches for direct buried conduit shall be free of rocks and other material.

   c. All joints in conduit shall utilize conduit manufacturer's specified joint compound.

3. All nicks, cuts, abrasions, etc. of the PVC jacket shall be patched to the project Engineer's satisfaction utilizing conduit manufacturer's specified patch materials

4. Liquid-tight flexible metal conduit shall be used for connections to vibrating equipment in wet and damp locations and exterior locations. Install liquid- tight flexible metal conduit so that liquids run off surface and drain away from fittings. Provide not less than 18-inch and not more than 24-inch length where practical. Shorter lengths shall have project Engineer's approval prior to installation.

D. Raceway Fastening and Supports:

1. Supports:

   a. Secure support and fasten in place exposed raceways at intervals of not more than 4 feet, within 3 feet of any bend and termination to outlet or junction box. This shall apply on vertical runs as well as horizontal runs.

   b. Support individual horizontal conduits not larger than 1-1/2 inches in diameter by means of malleable one-hole pipe straps with matching back strap or properly sized Unistrut- type straps where applicable.

2. Fastenings:

   a. To Concrete or Solid Brick Masonry: By expansion bolts. Holes drilled to a depth of more than 1-1/2 inch in reinforced concrete beams or to a depth of more than 3/4 inch in concrete joists shall avoid cutting the main reinforcing bars. Holes not used shall be filled with mortar.

   b. To Steel Work: Machine screws, welded threaded studs, or spring- tension clamps. Raceways or pipe straps shall not be welded to steel structures.

   c. Nail-type nylon anchors or threaded studs driven in by a powder charge and provided with lock washers and nuts may be used in lieu of expansion bolts or machine screws.

   d. Threaded C-clamps shall not be used.

E. Conduit Sealing Fittings:

   1. Provide conduit sealing fittings as required by the NEC and as shown on the Project Drawings.

F. Raceways Seals:

   1. Seal the end entering the equipment and device box with the specified sealing compound to prevent the entrance of gases.
   2. Conduit with Wires. Separate wires so that sealant can penetrate between wires, and between wires and conduit

END OFSECTION

86-7 SUMP PLC REQUIREMENTS

PART I. GENERAL

1.1 WORK INCLUDED

A. The work described in this section consists of furnishing all labor, materials, equipment, and installation required for the complete, satisfactory, and approved systems as indicated on the Project Drawings and called for in these Specifications.

B. The Contractor shall install complete and operating electrical systems as indicated in Section 26 00 00, Basic Electrical Requirements and as stated in the below specification.

1.2 CODES AND STANDARDS

A. Reference within these Specifications to standards, codes, or reference specifications implies that any item, product, or material so identified must comply with all minimum requirements as stated therein, unless indicated otherwise. Only the latest revised editions are applicable.

B. The Specifications, codes, and standards listed below form a part of these Specifications:

1. National Electrical Code (NEC).
2. Underwriters' Laboratories (UL).
3. National Electrical Manufacturers Association (NEMA).
4. Insulated Cable Engineers Association (ICEA).
5. American Society for Testing and Materials (ASTM).
6. Instrument Society of America (ISA).

C. Testing and Laboratory Listing/Approval: Equipment and material shall be UL listed where standards have been established, and shall be identified for the purpose intended. Obtain and pay for all necessary laboratory testing, inspection, and approval of unlisted equipment or material where listing is required by the Department of Building and Safety.

1.3 DRAWINGS

A. The Project Drawings indicate the extent and general arrangements of equipment and wiring systems. If any departures from the drawings are deemed necessary by the Contractor, details of such departures and

reasons therefor shall be submitted to the Engineer for approval within 30 days after award of the Contract. No such departures shall be made without the prior written approval of the Engineer. All items not specifically mentioned in the Specifications or noted on the drawings but obviously necessary to make a complete working installation shall be included.

1.4 SUBMITTALS

A. Shop Drawings:

1. Refer to Section 86, Basic Electrical Requirements, for submittal requirements.

B. Operation and Maintenance Manuals:

1. The operation and maintenance manuals shall include the name, address, and phone number of the supplier and nearest manufacturer's representative and shall contain a complete parts list for each system. The operation and maintenance manuals shall include the name, address, and phone number of the supplier and nearest manufacturer's representative and shall contain a complete parts list for each system.

2. The Contractor will reference the Operation and Maintenance manual for the SCADA system.

a. The manual will provide specific instructions on:

1) How to connect to the SCADA system once you are connected to the County network.

2) How to retrieve data from the system.

3) How to change set points

4) Manual overriding of pumps, valves, and motors

5) Minimum troubleshooting instructions for:

a)how to reboot the computers

b) how to re-align the antenna

c)how to re-connect control panels to the WIFI network

d) how to test for panel connectivity

e) how to test data logging at the panel and at the SCADA PC

f) how to recover lost data from the panel USB stick

1.5 EQUIPMENT MANUAL AND OWNER INSTRUCTIONS

A. Upon completion of the work, the Contractor shall prepare and deliver to the Engineer **five** complete sets of the operation and maintenance manuals for each electrical system installed. The manuals shall consist of detailed drawings of catalog sheets for each component, replacement parts lists, wiring diagrams, maintenance instructions, and description of system operation. Contractor shall provide five hard copy sets and an electronic file in an Engineer-approved format.

B. Contractor shall provide five sets of PLC, communication, SCADA configuration and program software in hard copy and County-approved electronic format.

C. The Contractor shall provide qualified instructors for a minimum of 8 hours of instruction to designated County personnel in the operation and maintenance of all systems.

1.6 COORDINATION WITH OTHER TRADES

A. The Contractor shall plan and lay out the electrical work in order to be compatible with the site, equipment location, panel mounting, and piping system.

1.7 STORAGE

A. All materials shall be stored in a safe, orderly manner. Materials shall not be stored directly on the ground or floor and shall be kept clean, dry, and free from damage or deteriorating elements. Damaged or rusted materials shall not be installed.

1.8 MATERIALS

A. All equipment, materials, and components shall be new, standard, current products by manufacturers regularly engaged in the production of such equipment and be the manufacturer's latest design. All components by same manufacturer shall be mechanically and electrically compatible with rating of apparatus in which they are installed. All materials shall bear the label of Underwriters Laboratory for the intended use in all cases where this labeling is available or shall be materials reviewed by the code enforcing authorities and Engineer. Equipment of a similar nature shall be identical.

B. The Contractor shall provide and install the specified component, and no substitutions will be allowed for items listed as sole-sourced.

1.9 ACCESSORIES

A. All hardware and accessory fittings shall be of a type designed, intended, or appropriate for their use, complement the items with which they are used, and shall have corrosion protection suitable for the atmosphere in which they are installed. All such hardware shall be U.S. standard sizes.

1.10 INSTALLATION

A. All materials shall be installed at the locations shown on the drawings and in accordance with the specific manufacturer's recommended installation methods.

B. All equipment shall be set level at the correct heights, properly aligned, and, where in sections, shall be bolted together.

C. Secure all materials and equipment firmly in place. Do not weld electrical materials for attachment and/or support.

D. All screws, bolts, nuts, clamps, fittings, or other fastening devices shall be made up tight.

E. All materials and equipment shall be installed complete, including screws or bolts, covers, plates, fittings, etc.

F. Follow the installation directions and recommendations of the materials and equipment manufacturers.

1.11 IDENTIFICATION

A. Electrical equipment shall be clearly and permanently labeled with a securely fastened nameplate. Nameplates shall be 1/16-inch thick engraved laminated plastic and shall have 3/16-inch high white letters on a black background. Nameplates shall be provided for all fused disconnect, control panel, and circuit breaker panels.

B. All conductors shall be permanently tagged at wire trough and terminal boxes. Feeders shall be identified at every accessible point with a permanent tag indicating circuit number.

Conductor tags shall be non-conductive.

C. All circuits and equipment shall be identified to correspond with drawings and specifications.

D. Panel board shall contain a typewritten directory behind a plastic cover, located on inside of door.

E. Install equipment identification nameplate at the top center of the equipment, using a rubber-based adhesive.

1.12 CONNECTION

A. Make all connections for the power distribution and control devices. Install and connect motor starters and controls, including exact wiring requirements as determined in accordance with control wiring diagrams furnished for the equipment.

1.13 TESTING

A. Upon completion of the work, the Contractor shall energize, start up, and test operate all the systems and equipment in the presence of the Engineer and County. All testing and measuring instruments and equipment required to test each system shall be provided by the Contractor. Any defects or variances from standard or specified conditions found during these tests shall be corrected by the Contractor at no cost to the County. The following tests shall be performed:

1. The main service and all feeders and branch circuits shall be energized from the normal power source. Amp meter and volt meter readings shall be made and recorded as follows:
   a. Phase to phase and phase to ground voltage at the main service connection at motor starters or and panel board.
   b. Correct pump motor rotation direction.
2. All circuit breakers shall be manually tripped and reset.
3. All defective lamps found during test shall be immediately replaced.
4. All receptacles and light switches shall be tested to verify they are connected properly.
5. All motors and controls shall be checked to verify correct connection and operation.
6. Wire trough and panel board shall be inspected prior to installing covers to verify correct sizes and color coding.
7. A complete operating test of the instrumentation and control systems shall be made to verify correct operation of each system and all related equipment.
8. The Contractor will perform resistance grounding test as per 26 05 26-1 2.1 B.2.
9. Final acceptance of the system will require that SCADA system run for the period of 30 consecutive days without loss of basic functions.

B. Prior to the final test, continuity tests and insulation resistance tests shall be performed to assure there are no shorts or unintentional grounds in the entire electrical system. Test readings shall be recorded and given to the Engineer.

1.14 PERSONNEL AND EQUIPMENT

A. The Contractor shall provide the following:

1. Qualified personnel to conduct all testing.
2. The services of the equipment manufacturer's representative to assist in testing their equipment, when the service is specified.
3. The services of the equipment manufacturer's representative to assist the Contractor in the repair or troubleshooting of their equipment in the event that said equipment fails to pass all tests.
4. All labor and equipment required for testing.

1.15 CLEAN-UP AND PAINTING

A. After all systems and equipment have been installed; the Contractor shall clean all electrical equipment inside and outside the enclosures. All grease, dust, rust, and chipped plaster and concrete shall be removed from the installed equipment. Each piece of equipment shall be thoroughly cleaned and left in new condition. The project will not be accepted as being finished until all such dirt and contamination has been removed. The Contractor shall provide touch-up painting where finished surfaces have received minor scratches during installation. Where electrical equipment with painted surfaces has been installed in finished areas, any such damage to the painted surfaces that cannot be corrected with minor touch-up painting shall be refinished at the factory at no cost to the County. Equipment installed in finished areas having noticeable damage to the finished surface will not be accepted.

PART 2. PRODUCTS

2.1 PLC

A. Approved PLC manufacturer is Automation Direct as shown on the Plans.

2.2 PLC HARDWARE

A. Minimum of 1 Rack with 9 slot count.
B. The H2-ECOM-100 is the only approved Ethernet card. It will be installed in the last slot of the first rack.
C. D2-FILL will be used to fill spare slots.

2.3 COMMUNICATION PROTOCOL

A. The PLC's will communicate via the H2ECOM-100 card using ECOM. The Contractor will provide Windows-based drivers by Kepware (KepServer EX) for the Kayo family of PLC's.

B. Wi-Fi radio module to be MOXA AWK-3121 US-T for high ambient temperature applications.

2.4 FUNCTIONALITY

A. The operator will have remote start/stop and alarm reset ability from 3rd party SCADA via Windows based PC communications driver. The Contractor will configure the KepServer EX to use the Suite Link communications between the driver and the HMI application.

2.5 DISPLAY

A. The Control Panel shall be provided with operator interface display for the viewing of system parameters, control set points, alarms and shutdowns.

B. The Control Panel shall have the same functionality as the County's existing system.

C. The operator will have full control of the sump.

1. They will be able to adjust set points, start and stop the sump and any associated equipment.
2. They will be able to manually operate any associated equipment via the touch screen.
3. A minimum of 3 security levels to match the existing system will be required for the display.
    a. None- the user has view-only rights on all the system parameters.
    b. Operator- the user can view all system parameters, and can stop/start the sumps.
    c. Engineer- the user has the same access privilege as the operator but can also modify PID parameters and force logic.

D. Display shall be installed on an inner door behind the main control panel door.

E. The touch screen display shall be an Automation Direct PN: EA7-T6CL.

a. It shall be supplied with one 128 megabyte flash drives. The Contractor will setup the panels to log the following data to the USB drive:
    i. Liquid level and Liquid Flow

b. The AC power adapter: EA-AC.

c. One (1) EA-CF-128MB CF card.

2.6 CONTROL PANEL

A. Climate control from Section 26 09 18 will be required.

B. External controls:

1. External panel disconnect shall be provided. It shall be located on the right side of the panel.
2. HOA / HO controls for the pump will be installed on the inner door.
3. The panel will contain a single stack beacon.
    i. A flashing red light indicating high liquid level or motor fault
    ii. A flashing blue light for SCADA or communication problem.
4. The wireless radio antennas shall be connected using lightning surge arrestors. The surge arrestors will ground to the panel.
5. The panel will be grounded using a copper grounding rod at least 10 feet long. The locations of utilities and the liner shall be verified with Engineer before installation of grounding rods.

2.7 PLC ALARMS

A. The PLC shall provide all the alarms necessary to safely control the equipment.

1. The PLC shall make available all the alarms to a 3rd party SCADA. Address list with the alarm descriptions and set points shall be provided.
2. The PLC shall provide remote alarm acknowledgement via the SCADA.
3. In addition to the alarms above, the PLC shall provide open loop alarms for all analog signals. If these signals are used to control equipment, then the alarms will cause the system/equipment to stop.

2.8 FACTORY TEST AND GUARANTEE

A. The Manufacturer shall test the completed panel in their facility and shall provide a written report detailing the results of the test.

B. If not specifically indicated for a longer period, equipment and accessories supplied by the Manufacturer under this Division shall be guaranteed for a period of not less than one year from date of acceptance by the County. One year guarantee on all equipment, regardless of shipping date.

PART 3. EXECUTION

3.1 INTEGRATED SYSTEM

A. New control panel PLC and HMI touch screen to be configured and function similar to existing.

B. The following functions shall be included in the 3rd party SCADA application Landfill Module Leachate and Lysimeter Sumps interface:

1. Sump liquid level (actual)
2. Sump pump on/off status
3. Sump pump auto/ start/ stop
4. Flow rate and totalizer with reset
5. Runtime hours
6. Runtime status
7. HOA / HO Selector indication
8. Alarm status

3.2 PANEL SCREEN FUNCTION

A. All analog values shall include color changing indicators when the operating parameters exceed limits. These limits shall be user configurable by the user "Engineer."

1 LOLO = blue

2 LO = cyan

3 Normal = green

4 HI = yellow

5 HIHI = red

B. All analog points shall have a pop-up information screen indicating the above parameters, a description of that point and its P&ID reference number.

END OF SECTION

86-8 CONTROL PANEL REQUIREMENTS

PART 1. GENERAL

1.1 CODES AND STANDARDS

A. Reference within these Specifications to standards, codes, or reference specifications implies that any item, product, or material so identified must comply with all minimum requirements as stated therein, unless indicated otherwise. Only the latest revised editions are applicable.

B. The Specifications, codes, and standards listed below form a part of these Specifications:

1. National Electrical Code (NEC).
2. Underwriters' Laboratories (UL).
3. National Electrical Manufacturers Association (NEMA).
4. Insulated Cable Engineers Association (ICEA).
5. American Society for Testing and Materials (ASTM).
6. Instrument Society of America (ISA).

C. Testing and Laboratory Listing/Approval: Equipment and material shall be UL listed where standards have been established and shall be identified for the purpose intended. Obtain and pay for all necessary laboratory testing, inspection, and approval of unlisted equipment or material where listing is required by the Fresno County Department of Public Works and Planning.

1.2 DRAWINGS

A. Refer to Section 86 for Work depicted by Drawings

1.3 SUBMITTALS

A. Refer to Section 86 for submittal requirements

1.4 EQUIPMENT MANUAL AND COUNTY INSTRUCTIONS

Upon completion of the work, the Contractor shall prepare and deliver to the Engineer two complete sets of the operation and maintenance manuals for each electrical, system installed. The manuals shall consist of detailed drawings of catalog sheets for each component, replacement parts lists, wiring diagrams, maintenance instructions, and description of system operation.

1.5 STORAGE

All materials shall be stored in a safe, orderly manner. Materials shall not be stored directly on the ground or floor and shall be kept clean, dry, and free from damage or deteriorating elements. Damaged or rusted materials shall not be installed.

1.6 MATERIALS

A. All equipment, materials, and components shall be new, standard, current products by

manufacturers regularly engaged in the production of such equipment and be the manufacturer's latest design. All components by same manufacturer shall be mechanically and electrically compatible with rating of apparatus in which they are installed. All materials shall bearthe label of Underwriters Laboratory for the intended use in all cases where this labeling is available or shall be materials reviewed by the code enforcing authorities and Engineer. Equipment of a similar nature shall be identical.

B. The Contractor shall provide and install the specified component, and no substitutions will be allowed for items listed as sole-sourced.

1.7 ACCESSORIES

A. All hardware and accessory fittings shall be of a type designed, intended, or appropriate for their use, complement the items with which they are used, and shall have corrosion protection suitable for the atmosphere in which they are installed. All such hardware shall be U.S. standard sizes.

1.8 INSTALLATION

A. All materials shall be installed at the locations shown on the Project Drawings and in accordance with the specific manufacturer's recommended installation methods.

B. All equipment shall be set level at the correct heights, properly aligned, and, where in sections, shall be bolted together.

C. Secure all materials and equipment firmly in place. Do not weld electrical materials for attachment and/or support.

D. All screws, bolts, nuts, clamps, fittings, or other fastening devices shall be made up tight.

E. All materials and equipment shall be installed complete, including screws or bolts, covers, plates, fittings, etc.

F. Follow the installation directions and recommendations of the materials and equipment manufacturers.

1.9 IDENTIFICATION

A. Electrical equipment shall be clearly and permanently labeled with a securely fastened nameplate. Nameplates shall be 1/16-inch thick engraved laminated plastic and shall have 3/16-inch high white letters on a black background. Plates shall be provided for all fused disconnect, control panel, and circuit breaker panels.

B. All conductors shall be permanently tagged at wire trough and terminal boxes. Feeders shall be identified at every accessible point with a permanent tag indicating circuit number. Conductor tags shall be non-conductive.

C. All circuits and equipment shall be identified to correspond with drawings and specifications.

D. Install equipment identification nameplate at the top center of the equipment, using a rubber-based adhesive.

1.10 TESTING

A. Upon completion of the work, the Contractor shall energize, start up, and test operate all the systems and equipment in the presence of the Engineer and County. All testing and

measuring instruments and equipment required to test each system shall be provided by the Contractor. Any defects or variances from standard or specified conditions found during these tests shall be corrected by the Contractor at no cost to the County. The following tests shall be performed:

1. The main service and all feeders and branch circuits shall be energized from the normal power source. Amp meter and volt meter readings shall be made and recorded as follows: Phase to phase and phase to ground voltage at the main service connection at motor starters and panel board.
2. All circuit breakers shall be manually tripped and reset.
3. All defective lamps found during test shall be immediately replaced.
4. All receptacles and light switches shall be tested to verify they are connected properly.
5. All motors and controls shall be checked to verify correct connection and operation.
6. Wire trough and panel board shall be inspected prior to installing covers to verify correct sizes and color coding.
7. A complete operating test of the instrumentation and control systems shall be made to verify correct operation of each system and all related equipment.

B. Prior to the final test, continuity tests and insulation resistance tests shallbe performed to assure there are no shorts or unintentional grounds in the entire electrical system. Test reading shall be recorded and given to the Engineer.

1.11 CLEAN-UP AND PAINTING

A. After all systems and equipment have been installed; the Contractor shall clean all electrical equipment inside and outside the enclosures. All grease, dust, rust, and chipped plaster and concrete shall be removed from the installed equipment. Each piece of equipment shall be thoroughly cleaned and left in new condition. The project will not be accepted as being finished until all such dirt and contamination has been removed. The Contractor shall provide touch-up painting where finished surfaces have received minor scratches during installation. Where electrical equipment with painted surfaces has been installed in finished areas, any such damage to the painted surfaces that cannot be corrected with minor touch-up painting shall be refinished at the factory at no cost to the County. Equipment installed in finished areas having noticeable damage to the finished surface will not be accepted.

1.12 PERSONNEL AND EQUIPMENT

A. The Contractor shall provide the following within 15 days of Notice of Award:

1. Qualified personnel to conduct all testing.
2. Requirements for Contractors/Sub-Contractors:
   a. Submit resume qualifications
   b. Work history of at least 6 similar projects including the following experience.
   c. PLC installation: 4 years minimum experience
   d. Wonderware: 4 years minimum experience
   e. WiFi installation: 4 years minimum experience
   f. Windows Server 2003 proficient
   g. Dell open manage software proficient

3. The services of the equipment manufacturer's representative are to assist in testing their equipment, when the service is specified.
4. The services of the equipment manufacturer's representative to assist the Contractor in the repair or troubleshooting of their equipment in the event that said equipment fails to pass all tests.
5. All labor and equipment required for testing.

PART 2. PRODUCTS

2.1 CONTROL PANEL

A. DRAWINGS

1. Before the Contractor will be authorized to build the panel, the Contractor shall provide Bill-of-Materials, panel layout drawing, and manufacturer cut sheets.
2. Upon acceptance of the control panel the contactor shall provide AS-BUILT documentation of the control panel within 2 weeks of the written acceptance.

B. PANEL RATINGS

1. The panel shall be rated for the specified area classification, but shall be a minimum of NEMA 3R/12/4 for unclassified areas.
2. The panel shall be no less than 16" deep, unless otherwise specified by the Engineer or Contract Drawing set.

C. CLIMATE CONTROL

1. Cooling
   a. Panel heat exchanger will be used to control the internal panel temperatures. The heat exchanger will not mix panel air with outside air.
   b. The panel heat exchanger will be supplied with louvered inlet with removable filter, and exhaust vents.
   c. The panel rating with the heat exchanger installed will not be less than NEMA-3/3R.
2. A panel heater will be sized to maintain the panel at 40° F in -5° F weather. The panel heater will be wired through a breaker.

D. PANEL APPEARANCE

1. The control panel external door will be supplied with the door hinged on the left-hand side.
2. The control panel exterior color shall be stainless steel. This applies to leachate control panels
3. The inner door shall be hinged on the left-hand side and white in color.
4. The inner door will have a thumb screw locks that will not require more than 1/2 a turn to open or close.
5. The panel shall have interior panel lighting with manually operated switches located on the top left comer of inner door.
6. The control panel shall be lockable using a standard lock to be supplied by Engineer.

7. Indication lights, switches, and buttons shall be installed on the inner panel door. No devices shall be installed on the exterior panel door.

E. WIRING

1. All PLC I/0 shall be wired to terminals.
2. Unused I/0 shall be labeled as spare.
3. Panel wiring shall be color coded per NEC code requirements.
4. Minimum wire size for control wire is 18 AWG.
5. Analog isolators shall be provided for all analog circuits. The only acceptable isolators are Automation Direct part numbers.
6. No components shall be installed on the back panel closer than 1" from any wall.
7. Panel shall be U.L. labeled.
8. All conduit runs shall enter the panel through the bottom of the panel.
9. All radio antenna cables shall enter the panels through the bottom of the enclosures and be provided with drip loops.

F. WIREWAY

1. The minimum wireway height will be 4".
2. A minimum clearance of l inch shall be kept between the wireway and wire terminals and or devices.
3. The wireway shall be dark grey color only.
4. The back panel will be framed by wireway.
5. The wireway will be installed inset a minimum of 1/2" from the edge of the backpanel.

G. RECEPTACLES

1. Quantity of four (4) grey 120VAC receptacles with a breaker shall be provided and wired through a breaker.

H. EMT ISOLATION

1. If 480 VAC is provided in the panel, it will be isolated from the control voltages (120 VAC/+24VDC).
2. The panel will be supplied with EMI protection for control voltages.

I. POWER

1. All 120 VAC circuits shall have breakers. Fuses are not permitted.
2. A 500 VA UPS battery backup shall be provided. Acceptable manufacturers are:
   a. Tripplite
   b. Belkin
   c. APC
3. The PLC and the DC power supply will be provided with a standard PC 120 VAC pigtail. These pigtails will be plugged into the battery backup.

4. The 24VDC power supply commons (0 VDC) shall be grounded.
5. A minimum of five spare terminals shall be supplied for 24VDC and 0 VDC; for a total of 10, five of each.

J. TERMINAL BLOCKS

1. Grey with pre-printed numbers
2. Terminal shall be jumpered using center comb-jumper only.
3. Terminals will be sized to accept gauge wires used.
4. Terminal blocks will be sized to clip on to 35mm din rail.

K. LABELING

1. All wires shall be labeled with preprinted labels on both ends.
2. The wire labels MUST match the design drawings labels.
3. All terminals shall be labeled with preprinted labels.
4. All panel devices (breakers, relays, etc.) shall be labeled per the electrical schematic.
5. Engraved phenolic labels shall be provided for all hardware, switches, lights, power supplies, PLC racks, etc.

2.2 FACTORY TEST AND GUARANTEE

A. The Manufacturer shall test the completed panel in their facility and shall provide a written report detailing the results of the test.

B. If not specifically indicated for a longer period, equipment and accessories supplied by the Manufacturer under this Division shall be guaranteed for a period of not less than one year from date of acceptance by the County. One year guarantee on all equipment, regardless of shipping date.

PART 3. EXECUTION (NOT USED)

END OF SECTION

DIVISION XI MATERIALS

90 CONCRETE

Replace Section 90-1.01D(3) with:

90-1.01D(3) Shrinkage

If shrinkage limitations are specified, test the concrete under AASHTO T 160, modified as follows:

1. Prepare specimens that have a 4 by 4-inch cross section.
2. Remove each specimen from the mold 23 ± 1 hours after mixing the concrete and place the specimen in lime water at 73 ± 3 degrees F until 7 days age.
3. Take a comparator reading at 7 days age and record it as the initial reading.
4. Store the specimens in a humidity-controlled room maintained at 73 ± 3 degrees F and 50 ± 4 percent relative humidity for the remainder of the test.
5. Take subsequent readings at 7, 14, 21, and 28 days drying.

Perform AASHTO T 160 testing at a laboratory that is accredited to perform AASHTO T 160 or that maintains a current rating of 3 or better for the Cement and Concrete Reference Laboratory concrete proficiency sample program.

Shrinkage test data authorized by Caltrans no more than 3 years before the 1st day of the Contract is authorized for the entire Contract. The test data must be for concrete with similar proportions and using the same materials and material sources to be used on the Contract. Concrete is considered to have similar proportions if no more than 2 mix design elements are varied and the variation is within the tolerances shown in the following table:

Mix design element	Tolerance (±)
Water to cementitious material ratio	0.03
Total water content (%)	5
Coarse aggregate content (%)	10
Fine aggregate content (%)	10
SCM content (%)	5
Admixture as originally dosed[a] (%)	25

[a]Admixtures must be the same brand.

Replace Section 90-2.02E With:

90-2.02E Production

Sections 90-1.02F, 90-1.02G(1), 90-1.02G(2), 90-1.02G(3), and 90-1.02G(4) do not apply to minor concrete.

Store, proportion, mix, transport, and discharge the cementitious material, water, aggregate, and admixtures in compliance with recognized standards of good practice that result in thoroughly and uniformly mixed concrete suitable for the intended use. Recognized standards of good practice are outlined in various industry publications, such as those issued by ACI, AASHTO, or by Caltrans.

Use a quantity of water that produces concrete with a consistency that complies with section 90-1.02G(6). Do not add water during hauling or after arrival at the delivery point unless allowed by the Engineer.

Discharge ready-mixed concrete from the transport vehicle while the concrete is still plastic and before stiffening occurs. Take whatever action is necessary to eliminate quick stiffening, except do not add water.

Conditions contributing to quick stiffening are:

1. Elapsed time of 1.5 hours in agitating hauling equipment or 1 hour in nonagitating hauling equipment
2. More than 250 revolutions of the drum or blades after introduction of the cementitious material to the aggregates
3. Concrete temperature over 90 degrees F

The mixing time in a stationary mixer must be at least 50 seconds and no more than 5 minutes.

The minimum required revolutions at mixing speed for transit-mixed concrete must be at least that recommended by the mixer manufacturer and must be increased as needed to produce thoroughly and uniformly mixed concrete.

If you add a high-range water-reducing admixture to the concrete at the job site, the total revolutions must not exceed 300.

Replace Section 90-4.02 With:

90-4.02 MATERIALS

You may use Type III portland cement in PC concrete.

The specifications for SCM content in section 90-1.02B(3) do not apply to PC concrete.

For PC concrete, the SCM content must comply with one of the following:

1. Any combination of portland cement and SCM satisfying the following equation:

Equation 1:

$[(25 \times UF) + (12 \times FA) + (10 \times FB) + (6 \times SL)]/TC \geq X$

where:
UF = silica fume, metakaolin, or UFFA, including the quantity in blended cement, lb/cu yd
FA = natural pozzolan or fly ash complying with AASHTO M 295, Class F or N, with a CaO content of up to 10 percent, including the quantity in blended cement, lb/cu yd
FB = natural pozzolan or fly ash complying with AASHTO M 295, Class F or N, with a CaO content of greater than 10 percent and up to 15 percent, including the quantity in blended cement, lb/cu yd
SL = GGBFS, including the quantity in blended cement, lb/cu yd
TC = total quantity of cementitious material, lb/cu yd
X = 0.0 for innocuous aggregate, 3.0 for all other aggregate

2. 15 percent Class F fly ash with at least 48 oz of $LiNO_3$ solution added per 100 lb of portland cement. The CaO content of the fly ash must not exceed 15 percent.
3. Any combination of SCM and portland cement for which the expansion of cementitious material and aggregate does not exceed 0.10 percent when tested under ASTM C1567. Submit test data with each mix design. Test data authorized by Caltranst no more than 3 years before the 1st day of the Contract is authorized for the entire Contract. The test data must be for the same concrete mix and must use the same materials and material sources to be used on the Contract.

If municipally supplied potable water is used for PC concrete, the testing specified in section 90-1.02D is waived unless requested.

Portland cement based repair material must be on the Authorized Material List for precast Portland cement based repair material.

DIVISION XII BUILDING CONSTRUCTION

99 LEACHATE/LYSIMETER ASSEMBLY

99-1.01 LEACHATE/LYSIMETER METER, METERING PIPE & FITTINGS

PVC Plastic Pipe and Fittings shall be furnished and installed including but not limited to all labor, materials, tools, supervision, transportation, equipment and incidentals necessary to install PVC plastic pipe and fittings as shown on the Plans, as specified in these Special Provisions, and as directed by the Engineer.

All PVC piping used in the Work shall be Schedule 80, unless noted otherwise. PVC piping used in the Work shall meet the standardized dimensional requirements of ASTM D-1785 for Schedule 40, 80, and 120 PVC pipe.

PVC fittings used in the Work shall meet the requirements of ASTM D-2464, ASTM D-2466, and ASTM D-2467 for PVC fittings.

PVC pipe made in accordance with ASTM D-1785, Schedule 40, 80, and 120, shall have an ASTM D-1784 Cell Classification of 12454.

PVC Pipe shall meet Dimensions and Tolerances (IPS Schedule 40 Series), Pipe Flattening, and Impact Strength requirements of ASTM F-891.

The following information shall be clearly marked on the fittings and pipe, at regular intervals:

A. Name and/or trademark of the pipe manufacturer.

B. Nominal pipe size.

C. Pipe Schedule.

D. Material designation (e.g. PE 3408).

E. Production code for which date and place of manufacture can be determined.

All PVC fittings used in the work shall be Schedule 80, unless noted otherwise. Fitting components that use socket type solvent welded connections shall have socket diameters, lengths, and wall thickness as required by ASTM D-2466 for SCH 40 or ASTM D-2467 for SCH 80.

Schedule 80 components using taper pipe thread connections shall have thread lengths, diameters, and configurations in conformance with ASTM D-2464 and ANSI B 1.20.1.

Fittings shall be industrial, heavy duty, hub style.

Unions shall be O-Ring seal type having interchangeable components with true union valves for maximum system versatility. Unions intended for joining dissimilar materials shall be the transition type, which utilize components of the two dissimilar materials, joined with an O-Ring or flex hose to absorb the thermal expansion differential.

Socket fittings shall be pressure rated the same as the corresponding size pipe prescribed by ASTM D-1785. Threaded fittings shall be pressure rated at 50% of the rating for socket fittings.

Valves, unions, and flanges shall be pressure rated at 150 psi for water service at 73 F, non-shock and have a minimum burst requirement 3.3 times the rated pressure, unless otherwise noted in these special provisions.

If necessary, provide 150-pound, flat-face, socket-type Schedule 80 PVC flanges. Diameter and drilling of flanges shall comply with ANSI B16.5 for Class 150. Provide full-face, neoprene flange gaskets, 1/16-inch thick with "A" scale hardness of 45 to 60 durometer. Provide correct number and sizes of hexagon bolts, washers, and hexagon nuts, electrogalvanized with zinc or cadmium.

PVC Solvent Primer: Provide solvent primer as recommended by PVC product supplier and complying with ASTM F 656.

PVC Solvent Cement: Provide medium-bodied solvent cement as recommended by PVC product supplier and complying with ASTM D 2564.

Contractor shall furnish and install Promag P 300 5P3B25-4RD5/0 from Endress-Hauser per manufacturer installation manual.

The Contractor shall handle pipe, fittings, valves and accessories in a manner that will ensure installation in sound, undamaged condition; equipment, tools, and methods used in unloading, reloading, hauling and laying pipe and fittings shall be such that the materials are not damaged and in a manner as to avoid shock. Pipe and fittings shall not be dropped or dumped.

The Contractor shall provide adequate storage for all materials and equipment delivered to the job site. Pipe, fittings and appurtenances shall be stored in a flat, horizontal position and/or per Manufacturer’s instructions, until ready for installation. Protect from direct sunlight for extended periods of time.

Joining, laying, suspending, and pulling of pipe shall be accomplished by personnel experienced in working with the specified pipe. Installation shall be as specified by the manufacturer's recommended installation procedures. The pipe couplings and fittings shall be cleaned of all foreign material such as dirt, grease, oil, or moisture prior to placement. The pipe shall be laid and suspended in a manner that does not damage pipe.

Adaptors for HDPE pipe to PVC shall be HDPE SDR 11 to 316 stainless steel threaded end as shown on the plans and specified in these Special Provisions.

Adjoining sections of PVC pipe shall be solvent cement welded. Solvent cemented joints shall be prepared

in accordance with ASTM D-2855. All contraction of solvent weld pipe and fittings shall be performed in accordance with ASTM F-402.

Pipe supports shall be 12-gauge double-strut posts at locations shown on the Drawings. Post and fittings shall be hot-dipped galvanized and conform to ASTM A36. All nuts, bolts, and washers shall be hot-dipped galvanized mild steel. Supports shall be Uni-Strut, or approved equal.

Ball valves shall have Type 316 stainless steel body and ball with glass-filled PTFE seats and PTFE seals. Valves shall be rated for 1,000 psi at 200° F maximum pressure, 28.95 inches Hg vacuum, and a temperature range of 0 to 450° F. Ball valves shall be McMaster-Carr or approved equal.

Check valves shall be swing check type with PVC body, flanged ends, ethylene propylene diene monomer (EPDM) seals, and spring-assist closure, rated at 150 psi, by Asahi, or equal. Any metal components shall be Type 316 stainless steel.

Valve connections shall be NPT female at the sizes shown on the Project Drawings.

Valves shall have an oval handle.

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

99-1.02 SUMP CONTROL PANEL BACKBOARDS AND HARDWARE

Sump control panel plywood backboards and hardware shall be manufactured, installed, and painted as shown on the Plans, as specified in these Special Provisions, and as directed by the Engineer.

Contractor's shall refer to Section 86 of these Special provisions for specifications for the fabrication and installation of Sump Pump Control Panels

Painting of the plywood backboards shall be per Specification Section 91-3, Paint for Timber.

Plywood used for the backboards shall not be treated wood.

Wood primer shall be the color white painted in two coats on each side. The primer can be placed prior to the erection of the backboards.

The finish coats of paint shall be two (2) coats of oil-based epoxy paint in the color white and shall be used and placed in two coats on each side of the plywood backboard. Paint the plywood per the manufacturer's recommendations.

Painting shall be done in a neat and workmanlike manner. Unless otherwise specified, paint shall be applied by brush, or spray, or roller, or any combination of these methods. Gun extensions shall not be used.

No separate payment will be made for preparing surfaces and for painting plywood backboards. Full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing surfaces and painting plywood backboards as shown on the plans, and as specified in these specifications and the special provisions, and as directed by the Engineer will be considered as included in the per each price paid for Furnish and Install Sump Control Panel Backboard and Hardware.

Channels and hardware to erect the backboards shall be 12-gauge solid hot-dip galvanized adhering to ASTM A 36. Channels shall be Uni-Strut P1000 or approved equal.

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

99-1.03 STEEL PIPE BOLLARD

Bollards shall be manufactured, installed, cleaned and powder coated as shown on the Plans, as specified in these Special Provisions, and as directed by the Engineer.

All pipe used in the construction of Bollards shall be ASTM A53 Type E or S, Grade B steel pipe (extra strong), schedule 80 with a nominal 6-inch diameter.

Individual bollards shall be constructed of a single length of pipe. Welding together of individual lengths of pipe to construct bollards shall not be allowed.

All bollards shall be placed in portland cement concrete footings with a minimum diameter of 15-inches. Said footings shall extend along the length of each bollard for a minimum distance of 18 inches above the bottom of the steel pipe, and shall extend at least 6-inches below the bottom of the steel pipe.
The steel pipe shall be filled with portland cement concrete and said concrete shall be struck off level with the top of each bollard.
Portland cement concrete shall be minor concrete and shall conform to the requirements for portland cement concrete contained in these Special Provisions. Concrete construction shall be cured in accordance with any of the methods described in Section 90-1.03B, “Curing Concrete”, of the Standard Specifications; except the curing compound, if used, shall be clear and non-pigmented.

The length of steel pipe bollards for “Sump and Lysimeter Riser” and for “Cleanout and Inspection Riser” shall be as shown on the Plans.
All exposed metal surfaces of bollards shall be cleaned and powder coated in conformance with these Special Provisions.
The Contractor shall remove all sharp corners prior to powder coating by creating a small chamfer with a grinder.
The Contractor shall remove heavy oil or grease with a scraper from surfaces to be powder coated with solvent vapor, alkali, emulsion (detergent), or steam. Only solvents that do not leave a residue may be used. The Contractor shall then remove any remaining foreign matter by brushing with stiff fiber or wire brushes, abrading, or cleaning with solutions of appropriate cleaners. The use of any cleaning solutions shall be followed by a fresh water rinse and the pipe shall then be wiped dry.
After cleaning, the steel pipe shall be blast-cleaned to remove all dirt, dust, mill scale, rust, corrosion products, oxides, paint, and other foreign matter.
When blast-cleaning is being performed near machinery, all journals, bearings, motors and moving parts shall be sealed against entry of abrasive dust before blast-cleaning begins.
Blast-cleaned surfaces shall be inspected for surface preparation. Surface imperfections, such as slivers, scabs, burrs, weld spatter, and gouges, shall be removed by hand filing or grinding.
Blast-cleaned surfaces shall be protected from high humidity, rainfall, or surface moisture. No surface shall be allowed to flash rust before coating. If cleaned surfaces rust or are contaminated with foreign material before coating is accomplished, the surfaces shall be re-cleaned and, if required by the Engineer, re-blasted at the Contractor’s expense.
The Contractor shall submit proposed powder coating product data and manufacturer’s recommended application procedures for the Engineer’s approval prior to ordering said materials. All coatings shall be applied in conformance with the coating manufacturer’s recommended procedures.
The finish color is to be “CAT YELLOW” or approved equivalent.
The Engineer may reject the surface preparation and/or the coated pipe if the surface condition or application of the coating does not comply with the requirements of these Special Provisions. Bollards rejected because of inadequate cleaning or coating shall be re-cleaned and re-coated at the Contractor’s expense.

A minimum of two orange reflective tape bands, each not less than 3-inches wide, shall be mounted at least 1 1/2 inches apart and at a height on the post so that one orange reflective tape band will be between 2.5-feet and 3-feet above the finished grade ground surface.

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

99-1.04 CONCRETE SLAB

Concrete Slab shall conform to the provisions of Section 51 "Concrete Structures" of the Standard Specifications and these Special Provisions.

Concrete slabs shall be constructed of Class 3 concrete containing not less than 506 pounds of cement per cubic yard, to the dimensions shown on the Plans, as Specified in these Special Provisions, and as directed by the Engineer. Concrete placed below or outside of the limits shown or specified for the slabs shall not be paid for.

Class 3 concrete shall conform to the requirements for portland cement concrete contained in these Special Provisions.

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

100 LINER SYSTEM

100-1 GEOSYNTHETIC CLAY LINER

100-1.01 GENERAL

The Geosynthetic Clay Liner (GCL) to be furnished and installed under this contract shall conform to the requirements outlined herein along with the accompanying geosynthetics quality assurance plan.

The Contractor shall notify the Engineer 14 calendar days in advance of starting the GCL installation.

100-1.01.1 SUMMARY

A. Section includes furnishing and installing geosynthetic clay liner.

B. Related Sections:

1. Section 19-4 – Landfill Earthwork
2. Section 100-2 - High Density Polyethylene Geomembrane
3. Section 100-3 - Geocomposite
4. Section 100-4 - Geotextile
5. Section 100-5 - Operations Layer
6. Section 100-6 - Protective Plywood Cover

100-1.01.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D 422 - Method for Particle-size Analysis of Soil.
2. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.
3. ASTM D 751 - Method of Testing Coated Fabrics
4. ASTM D 1004 - Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
5. ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
6. ASTM D 2216 - Test Method for Laboratory Determination
7. Water (Moisture) Content of Soil, Rock, and Soil-aggregate Mixtures.
8. ASTM D 4354 - Standard Practice for Sampling of Geosynthetics for Testing.
9. ASTM D 4632 - Standard Test Method for Breaking Load and Elongation of Geotextiles (Grab Method).
10. ASTM D 4643 - Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method.
11. ASTM D 4759 - Standard Practice for Determining the Specification Conformance of Geosynthetics.
12. ASTM D 4873 - Identification, Storage, and Handling of Geosynthetics.

13. ASTM D 5084 - Standard Test Method of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.
14. ASTM D 5261 – Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
15. ASTM D 5321 - Standard Test Method for Determining the Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear.
16. ASTM D 5993 - Standard Test Method for Measuring Mass Per Unit Area of Geotextiles.
17. ASTM D 6243 - Standard Test Method for Determining the Internal and Interface Shear Strength of Geosynthetic Clay Liner by the Direct Shear Method.
18. ASTM D6768 – Standard Test Method for Tensile Strength of Geosynthetic Clay Liners
19. ASTM D 5887 - Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter.
20. ASTM D 5890 - Standard Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liner.
21. ASTM D 5891 – Standard Method for Determining Bentonite Fluid Loss.
22. ASTM D 6496 – Test Method for Determining Average Bonding Peel Strength Between the Top and Bottom Layers of Needle-Punched Geosynthetic Clay Liners.
23. ASTM D6768 – Standard Test Method for Tensile Strength of Geosynthetic Clay Liners.

B. Construction Quality Assurance (CQA) Plan for Phase III - Modules 9 & 10 Excavation and Liner System Construction, American Avenue Disposal Site.

100-1.01.3 DEFINITIONS

A. Bentonite: Clay soil, comprised primarily of sodium montmorillonite, characterized by high swelling potential and low hydraulic conductivity.

B. Construction Quality Assurance (CQA) Consultant: The party, independent from County or Contractor, that is responsible for observing and documenting activities related to the quality of material manufacturing, material installation, and other construction activities related to the project. Also responsible for issuing a CQA report sealed by a Professional Engineer registered in the State of California. Construction Quality Assurance (CQA) Laboratory: A laboratory selected by the CQA Consultant independent from the Engineer, Contractor, Manufacturer, Fabricator and Installer, responsible for conducting laboratory tests on samples of materials obtained at the site. Also referred to as the Geosynthetics Laboratory.

C. Construction Quality Assurance (CQA) Officer: A civil engineer, registered in the State of California as required by 27 CCR 20324(b)(2), who is responsible for implementing the CQA Plan, observing, verifying, and documenting the construction and for preparing, signing, and certifying the Construction Completion Report. Also referred to as the CQA Engineer. Construction Quality Assurance (CQA) Monitor: Site representative of the Engineer responsible for documenting field observations and tests.

D. Engineer: Director of the Department of Public Works and Planning of Fresno County, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

E. Geomembrane: A polymeric sheet material that is impervious to liquid, also referred to as flexible membrane liner, membrane, or liner.

F. Geosynthetic Clay Liner (GCL): is a relatively thin layer of processed clay (typically bentonite) fixed between two sheets of geotextile or bonded to a geomembrane.

G. Geosynthetic Installer (Installer): The Installer is responsible for proper installation of the geosynthetic components in accordance with the Drawings and Specifications. The Installer may be affiliated with the Manufacturer. Also called the Installer.

H. Geoelectric Leak Location Contractor: A firm with specific expertise in performing electric leak location surveys on exposed or covered geomembrane.

I. Lot: A unit of production, or a group of other units or packages, taken for sampling or statistical examination, having one or more common properties and being readily separable from other similar units.

J. GCL Manufacturer (Manufacturer): The party responsible for the production and quality of the GCL.

K. Minimum Average Roll Value (MARV): For geosynthetics, a manufacturing quality control tool used to allow manufacturers to establish published values such that the user/ purchaser will have a 97.7 % confidence level that the property in question will meet published values. For normally distributed data, "MARV" is calculated as the typical value minus two standard deviations from documented quality control test results for a defined population from one specific test method associated with one specific property.

L. Owner: County of Fresno

M. Textile Backing (textile or Geotextile): Geosynthetic support material consisting of woven slit film, needle-punched nonwoven, or spunlaced polymer fabric, used for supporting bentonite in a GCL.

100-1.01.4 SUBMITTALS

A. Qualifications (Manufacturer): The Contractor shall submit information necessary to evaluate the Manufacturer's qualifications in accordance with Section 100-1.01.5 of these Special Provisions at least 21 calendar days prior to ordering the material. Material shall not be ordered by the Contractor until the Manufacturer's qualifications have been reviewed and approved in writing by the Engineer.

B. Qualifications (Installer): The Contractor shall submit information necessary to evaluate the Installer's qualifications in accordance with Section 100-1.01.5 of these Special Provisions at least 21 calendar days prior to installation of the material. The submittal shall include the name of Installer and the names and resumes of the installation supervisor/field design engineer.

C. Quality Control Plan and Installation Procedures (Manufacturer) - The Contractor shall submit the following 21 calendar days prior to installation:

1. A copy of Manufacturer's quality control plan including a list of quality control tests performed and typical testing frequencies.

2. Manufacturer's recommended installation procedures.

D. Schedules and Drawings - the Contractor shall submit the following 14 calendar days prior to installation of the material:

1. An installation schedule which includes hours to be worked per day for each shift and which indicates all weather delay built into schedule.

2. Installation layout drawings showing the panel layout indicating laplines or matchlines and details not conforming to the Plans. Upon acceptance by Engineer, these drawings shall be the basis for installation of the GCL.

E. Product Data (Manufacturer) - the Contractor shall submit the following 14 calendar days prior to shipping material to the site:

1. Geotextile Backing Data:

a. Certification stating that the Geotextile meets the product requirements (Table 100-1A).

b. Copy of quality control certificates issued by Geotextile supplier (if different from GCL Manufacturer).

c. Copy of quality control tests performed by GCL Manufacturer.

2. Bentonite Data:

a. Certification stating that the bentonite meets the product requirements (Table 100-1A).

b. Copy of quality control tests performed by bentonite supplier if different from GCL Manufacturer).

3. GCL Data:

a. Certification stating that the GCL meets the product requirements (Table 100-1A).

b. Copy of quality control tests performed by GCL Manufacturer.

c. Permeability testing on typical product by independent laboratory.

d. The Manufacturer's product warranty.

e. Roll sample.

f. Roll length and width.

F. Field Quality Control Documents – the Contractor shall:

1. Submit prior to the start of installation, subgrade acceptance certificate signed by the Installer's installation supervisor for each area to be covered by the GCL.

2. Submit quality control documentation prepared during installation before demobilizing.

G. The Contractor shall submit the following upon completion of the installation:

1. A certification stating that the GCL has been installed in accordance with the Plans and Special Provisions.

2. The Contractor's installation warranty.

3. Reproducible as-built drawings showing the location of panels. The Contractor shall prepare as-built drawing on D-size sheets to a scale approved by the Engineer. The medium upon which the drawings are printed shall be approved by the Engineer. The drawings shall include a title block, project name, name of Installer, name and signature of the person preparing the drawings, and the date of drawing preparation. The drawings shall also be furnished in AutoCAD format on a CD.

100-1.01.5 QUALIFICATIONS

A. The manufacturer of the GCL shall manufacture the material in the United States or in Canada and shall have previously demonstrated the ability to produce this GCL by having successfully manufactured a minimum of ten million square feet of similar material for landfill lining installations. A list of similar projects completed in which the manufactured material has been successfully used shall be submitted.

B. The Installer of the lining material shall have previously demonstrated the ability to install this GCL by having successfully installed a minimum of five million square feet of similar liner material for landfill lining installations. A list of projects completed by the Installer in which similar product has been successfully installed shall be submitted.

100-1.01.6 QUALITY ASSURANCE

A. The Owner will engage and pay for the services of (1) Construction Quality Assurance (CQA) Consultant, and (2) Construction Quality Assurance (CQA) Laboratory for monitoring the quality and installation of the GCL unless otherwise specified.

B. The GCL Manufacturer shall allow the Engineer and Construction Quality Assurance Monitor (CQA Monitor) to visit the manufacturing plant prior to the manufacturing of the GCL for this project if such a visit is considered by the Engineer to be necessary to assure the quality of the liner material and its manufacturing. The manufacturing plant visit will be documented by the CQA Monitor. The purpose of the visit will be to:

   1. Observe the manufacturing process for the GCL.

   2. Review plant quality assurance laboratory and establish protocols for conformance testing with the third party laboratory.

   3. Observe conformance testing and establish specific conformance values.

C. Neither the Contractor nor the Manufacturer will charge any time, material, or other expenses to the Owner related to a plant visit by the Engineer, the CQA Monitor or designated representative.

D. The Contractor shall render assistance as necessary for the CQA Monitor to collect product samples and perform testing in accordance with the CQA Plan. The Contractor shall aid the CQA Monitor in product sampling by providing personnel and equipment necessary to move, cut, and protect GCL rolls.

E. GCL shall not be shipped to the site until all required conformance testing has been completed and the test results are determined to comply with the Specifications. If GCL is shipped before all required conformance testing has been completed and the test results are determined to comply with the Specifications, it will be at the Contractor's risk and the Contractor assumes all responsibility for the handling of GCL that is determined to not comply with the specifications.

F. Should the Contractor choose to have GCL shipped to the site before required conformance testing has been completed and the test results are determined to NOT comply with the specifications, those GCL rolls not meeting Specification requirements shall be stored separate from GCL that has been determined to comply with the Specifications. Those rolls not meeting Specification requirements should be readily marked with spray paint indicating the rolls do not meet Specification requirements and taped on either side of the rolls with a minimum of 3 feet X 2 inch wide red tape and preferably placed in an enclosed fenced area (k-rail or equivalent) to prevent accidental use in the project.

G. Conformance test results will be reviewed consistent with ASTM D 4759- Procedure B. If a test result is in non-conformance with the Specifications, all material from that individual lot sampling unit represented by the failed conformance test shall be catalogued as "failed" or non-conforming. Any individual lot sampling unit which fails initial testing shall be retested for all the methods which did not meet the acceptable Specification values. If the average of both tests for any initially non-conforming methods, confirm that the individual lot sampling unit is non-conforming, then the individual lot sampling unit failing the acceptable Specification value need to be rejected. Individual lot sampling units before and after the failed individual lot sampling unit or units in the lot will be resampled and retested for all applicable testing methods ("blocking tests"). Finally, the sequence of non-conforming individual lot sampling units in the lot shall be bounded/delineated by passing individual lot sampling units ("blocking tests"). Additional tests and replaced material will be provided at no additional cost to the Owner.

100-1.01.7 DELIVERY, STORAGE, AND HANDLING

A. General: The Contractor shall conform to the Manufacturer's requirements and ASTM D-4873 and D5888, as modified according to this Specification.

B. Delivery – the Contractor shall:

1. Notify the Engineer in writing 48 hours in advance of delivery. Material deliveries will not be allowed on site unless and until submittals pertaining thereto which are required prior to delivery have been reviewed and accepted and advance written notice of delivery has been provided to the Engineer in accordance with these Special Provisions.
2. The GCL shall be supplied dry (unhydrated, less than 35% moisture content) and be delivered to the site undamaged.
3. Deliver material to the site only after the CQA Monitor accepts required submittals.
4. Unload all material in the presence of the CQA Monitor.
5. Cover material with a waterproof, tightly-fitting, plastic covering resistant to ultraviolet degradation.
6. Ship material less than one month prior to scheduled installation.
7. Mark each roll with the following information:
    a. Manufacturer's name
    b. Product identification
    c. Lot and roll numbers
    d. Roll dimensions and weight

C. Storage – the Contractor shall:

1. Store rolls in space allocated by the Owner. Space shall be at high ground level or elevated above ground surface.
2. Stack no more than 3 rolls high.
3. Protect rolls from precipitation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.
4. Preserve integrity and readability of roll labels.
5. Any non-conforming rolls shipped to the site will be placed in an enclosed fenced area (k-rail or equivalent) to prevent accidental used in the project.
6. Store away from flames, sparks, and temperatures in excess of 49 deg C (120 deg F).
7. Any environmental condition that might damage the GCL

D. Handling – the Contractor shall:

1. Use appropriate handling equipment to load, move, or deploy GCL rolls. Appropriate handling equipment includes cloth chokers and spreader bar for loading, spreader and roll bars for deployment. Dragging panels on ground surface will not be permitted.
2. Handle rolls in a competent manner so that damage does not occur to the product or to its protective wrapping and follow handling procedures outlined in ASTM D 4873.
3. Immediately repair any damage to protective covering and perform repairs such that the GCL roll is protected from moisture and other deleterious conditions.
4. Maintain control of and responsibility for off-loading, storing, and transporting material from storage area to installation site.

100-1.01.8 WARRANTY

A. The Contractor shall provide a Manufacturer's Warranty for GCL material in compliance with the requirements of these Special Provisions. The Manufacturer’s Warranty shall:

1. Provide a minimum 20-year warranty for the material against deterioration due to exposure to buried elements.

2. Cover the costs of material replacement and installation; assuming the area is in a clean, dry, unencumbered condition. In the event the area cannot be rendered as such, compensation for defective material will be provided to the Owner on a pro rata basis for the estimated cost to the Owner at that time of supplying and installing material to a clean, dry, and unencumbered condition by a third-party installer.

B. The Contractor shall provide an installation warranty for GCL material in compliance with the requirements of these Special Provisions. The installation warranty shall provide a minimum of 2 year non-prorated warranty for the installation against defects.

100-1.02 PRODUCTS

100-1.02.1 MANUFACTURERS

Material shall be provided by a Manufacturer meeting the qualification requirements in Section 100-1.01.5 or by a distributor approved by a qualified Manufacturer.

100-1.02.2 BENTONITE

A. Shall be supplied in granular form.

B. Shall meet the requirements of Table 100-1A.

100-1.02.3 GEOTEXTILE BACKING

A. Shall be needle-punched nonwoven.

B. Shall meet the requirements of Table 100-1A.

100-1.02.4 GCL

A. Shall be produced in the United States or Canada. Material from other sources may be used only with prior written approval by the Engineer.

B. Shall consist of bentonite encapsulated by Geotextiles.

C. Shall have continuous water-proof laplines and matchlines printed directly on the Geotextile-type GCL at 6 and 9 inches from the edges of the rolls respectively.

D. Shall be wrapped around structurally-sound cores that can support weight of GCL without excessive bending or buckling. The core shall be accessible to stingers or rods placed full-length within the core.

E. Shall meet the requirements of Table 100-1A.

F. Geotextiles shall be needle-punched or lock-stitched together through the bentonite layer to form a stable composite. Adhesives may be used in addition to, but not in lieu of, needle-punching or lock-stitching.

G. Shall be continuously inspected for presence of needles and certified in writing to be “needle-free”.

H. Both sides of the GCL shall be nonwoven Geotextiles.

100-1.02.5 MANUFACTURER SOURCE QUALITY CONTROL

A. The Manufacturer shall perform quality control tests listed in Table 100-1A at the frequencies indicated in Table 100-1B.

B. The Contractor shall supply copies of test results to CQA Officer.

Table 100-1A

Properties for Geosynthetic Clay Liner

Test	Test Designation[1]	Requirement[2]
Bentonite (as received)		
Swell Index	ASTM D 5890	24 cc/2g min. avg.
Fluid Loss	ASTM D 5891	18 ml at 0% moisture content max. avg.
Geotextile (as received)		
Mass Per Unit Area	ASTM D 5261	5.9 oz/yd^2 min. avg.
GCL (as manufactured)		
Mass Per Unit Area[3]	ASTM D 5993	0.85 pounds/sf[4] min. avg.
Mass of Bentonite[3]	ASTM D 5993	0.75 lb/sf min. avg.
Moisture Content	ASTM D 5993	35% max. avg.
Tensile Strength[4]	ASTM D 6768	50 lb/in min. avg.
Permeability	ASTM D 5887	5.0 x 10^{-9} cm/sec[5] max. avg.
Flux	ASTM D 5887	1 x 10^{-6} cm^3/sec-cm^2 max. avg.
Peel Strength	ASTM D 6496	12 lb/in min. avg.
Residual Shear Strength	ASTM D 6243	See Table 100-2C

Notes:

(1) Alternate tests are allowed only with prior written approval of Engineer.

(2) The average of the test results should be calculated per the particular standard cited and compared to the minimum (maximum) value listed in this table; hence the values listed are the minimum average values and are designated as “min. avg.” When the property is a maximum value, the designation is “max. avg.”

(3) Mass of the GCL and bentonite is measured after oven drying per the cited test method.

(4) Measured in the machine direction.

(5) Measured under 5 psi confining pressure and 2 psi head pressure.

Table 100-1B

Manufacturer’s Testing for Geosynthetic Clay Liner

Test	Test Designation[1]	Frequency
Bentonite[2] (as received)		
Swell Index	ASTM D 5890	1 per 100,000 square feet
Fluid Loss	ASTM D 5891	1 per 100,000 square feet
Geotextile (as received)		
Mass Per Unit Area	ASTM D 5261	1 per 200,000 square feet
GCL (as manufactured)		
Mass Per Unit Area	ASTM D 5993	1 per 40,000 square feet
Mass of Bentonite	ASTM D 5993	1 per 40,000 square feet
Moisture Content	ASTM D 5993	1 per 40,000 square feet
Tensile Strength	ASTM D 6768	1 per 40,000 square feet
Permeability	ASTM D 5887	1 per batch[3]
Flux	ASTM D 5887	1 per batch[3]

Notes:

[1] One test per quantity indicated, minimum one test per lot.
[2] Frequencies based on material with ten percent moisture content.
[3] Minimum of 2 tests for permeability and 2 tests for flux.

100-1.03 EXECUTION

100-1.03.1 PREPARATION OF SUBGRADE

A. The Contractor shall prepare subgrade in accordance with the requirements of Section 19-4 Earthwork, of these Special Provisions.

B. The Contractor shall ensure that the subgrade has been compacted and smoothed to be free of surface irregularities, runs, loose soil, rocks, stones, sticks, roots, sharp objects, and any other protrusions that could damage the GCL.

C. The Contractor shall ensure that all voids and cracks in the subgrade have been filled.

D. The Contractor shall compact the subgrade to 95 percent maximum dry density (ASTM D-1557).

E. The Contractor shall prepare the subgrade so that it provides a firm, unyielding foundation for the GCL with no sudden, sharp, or abrupt changes of break in grade. No standing water shall be allowed.

F. The Installer shall certify in writing on the subgrade acceptance form that the surface on which the GCL is to be installed is acceptable.

G. The Installer shall not install GCL until the underlying subgrade has been inspected and accepted by the Installer and CQA Monitor.

H. The Contractor shall maintain the subgrade until the liner has been installed and accepted.

I. Any rough areas or damage caused by the GCL installation shall be repaired by the Contractor.

J. The Contractor shall round all grade breaks, including the leading edge of the anchor trench to a 6-inch radius to avoid a sharp bend in the GCL.

100-1.03.2 DEPLOYMENT

A. The Installer shall deploy the material only after underlying subgrade is accepted by Installer and CQA Monitor.

B. The GCL shall be deployed in the field in the same configuration as tested for interface strength. For example: the geotextile side of the GCL in contact with the geomembrane in the field shall be the same as the side used to perform the interface strength test.

C. The Installer shall not allow foot traffic on the GCL if the material is at a moisture content of 35 percent or greater.

D. The Installer shall deploy the GCL manually or by use of spreader bar attached to loader or backhoe without damaging the subgrade.

E. The Installer shall ensure that objects or moisture are not entrapped beneath the GCL.

100-1.03.3 JOINING

A. Overlaps:

1. For Geotextile-type GCLs, using the lapline and matchline as guides, the Installer shall overlap the material a minimum of 9 inches along length and heat-bonded (“lystered”).

2. The Installer shall overlap the material a minimum of 24 inches at ends of rolls, in sump areas, and in anchor trench areas.

3. Overlaps or seams are not allowed perpendicular to slopes greater than 10 percent provided the length of the slope is less than the maximum available roll length. In these areas the Installer shall place GCL in one piece along the entire slope, unless otherwise approved in writing by the Engineer.

4. In cases where the slope is greater than 10 percent, and the slope length is greater than the maximum manufactured GCL roll length, the following procedures shall be used:

   a. Install a maximum of one horizontal seam, at a minimum distance of 10 feet from the edge of the eastern slope of the perimeter leachate and lysimeter collection drains, within the lower 25 percent of the larger eastern side slope of the module.

   b. The lower GCL panel starting on the lower 25 percent of the larger eastern side slope shall be on continuous panel through the perimeter leachate and lysimeter collection drains.

   c. Horizontal seams from one panel to the adjacent panel shall be staggered a minimum of 5 feet.

   d. Seams shall be shingled such that the down slope edge of the upper GCL panel overlays the up slope edge of the lower GCL panel. Overlap for the seams shall be 4 feet minimum.

   e. Granular bentonite application shall be applied in accordance with Section B below.

B. Seams:

1. All GCL shall be overlapped in accordance with these Special Provisions and heat-bonded (“lystered”). Adding additional Bentonite along overlaps at 4 ounces per lineal foot is not required if Manufacturer can document that the permeability at the overlaps is no greater than the permeability of the GCL material. Approval to forego the use of additional bentonite along seams must be received in writing from the Engineer before installation begins.

2. The Installer shall use a lime spreader if powdered bentonite is used to reduce wind-blown particles.

3. The Installer shall not sew or use mechanical connections (except for repairs).

100-1.03.4 RESTRAINING AND PROTECTING

A. The Installer shall restrain GCL against wind using sandbags filled with fine-grained material.

B. The Installer shall maintain sandbags in place until GCL is covered.

C. The Installer shall cover the GCL with Geomembrane or temporary protective cover during the same working day that the GCL is installed. If overlying Geomembrane is not seamed the same day, the CQA Monitor may request Geomembrane edges to be pulled back by the Contractor to allow the CQA Monitor to inspect the GCL at no additional cost to Owner. Torn, punctured, or hydrated material shall be removed and replaced in accordance with Section 100-1.03.5 at no additional cost to Owner.

D. Any bentonite material in the GCL that becomes hydrated to a moisture content greater than 40 percent before being covered by Geomembrane will be rejected. Rejected material shall be removed and replaced by the Contractor at no cost to the Owner.

E. Installer shall be responsible for staging the Work so that no construction equipment needs to be driven over already deployed GCL panels while deploying subsequent GCL panels or subsequent geosynthetics.

F. Equipment used for placing soils shall not be driven directly over geosynthetics. A minimum thickness of 1 foot (300 mm) of material is required between a low ground pressure (LGP) dozer and underlying geosynthetics. A minimum thickness of 3 feet of material is required between rubber-tired vehicles and underlying geosynthetics. In areas of heavy vehicle traffic, such as access ramps, the material thickness should be at least 3 feet. In any case, the following table shall be complied with during construction:

G.

Maximum Allowable Equipment Ground Pressure (psi)	Initial Lift Thickness Over Geosynthetics (feet)
5	1.0
10	1.5
15	2.0
>20	>3.0

100-1.03.5 REPAIR PROCEDURES

A. The Installer shall remove punctured, torn, or hydrated material.

B. The Installer shall cover damaged areas with same type of GCL material with same side up.

C. The Installer shall overlap defective areas by a minimum of 12 inches in all directions.

D. The Installer may use adhesion tape or heat-bond (“lyster”) to keep patches in place.

E. The Installer shall apply loose bentonite to repairs as with normal overlaps at 4 ounces per linear foot.

100-1.03.6 FIELD QUALITY CONTROL AND QUALITY ASSURANCE

A. General:

1. Field quality control is the responsibility of the Installer who must document that the installation proceeds in accordance with this specification.

2. Field quality assurance is the responsibility of the CQA Officer who is assisted by the CQA Monitor and the Installer.

B. The Installer and CQA Monitor shall inspect:

1. The underlying surface for entrapped particles that may impact the GCL.

2. The surface of the GCL for needles, punctures, tears, thinning, or other evidence that the material may not meet specification requirements.

3. The GCL for evidence of premature hydration such as wet areas or swelling. Hydrated areas shall be removed and replaced with new GCL material.

4. Overlaps using the laplines and matchlines as a guide. The CQA Monitor shall periodically measure the distance of the laplines and matchlines from the edge of the GCL.

5. The bentonite seam to check the location of the seams over the overlap and the amount of bentonite (if used) or the GCL heat-bonding being used at all seams.

6. The Contractor shall not cover a section of GCL until the CQA Monitor has approved that section of the GCL.

C. The Installer shall aid the CQA Monitor in collecting samples for testing in accordance with the following:

1. The CQA Monitor shall reject any roll that cannot be identified.
2. Samples shall be taken at a minimum frequency at a frequency of one per lot or one per 100,000 square feet of material supplied, whichever results in greatest number of tests.
3. Samples shall be a minimum of two feet long and run the entire width of the roll.
4. Samples shall not be taken from the first two feet of a roll.
5. The CQA Monitor shall mark the roll number, machine direction, and the date on which the sample was taken on each sample.

D. Field Testing:

1. The CQA Monitor shall conduct moisture content tests in the field.
2. Reported values shall be the average of 5 specimens taken from the same sample.
3. If a sample passes the field moisture content testing (meets the requirements of Table 100-1A), the remaining portion of the sample shall be sent to the CQA testing laboratory described in Paragraph E below.

E. Laboratory Testing:

1. The following laboratory tests shall be conducted by the CQA laboratory according to the test methods in Table 100-1A, on samples passing field testing:
    a. Mass per Unit Area: ASTM D 5993
    b. Mass of Bentonite: ASTM D 5993
    c. Moisture Content (bentonite): ASTM D 5993
    d. Tensile Strength: ASTM D 6768
    e. Permeability (1 sample only): ASTM D 5887
    f. Flux (1 sample only) ASTM D 5887
    g. Peel Strength: ASTM D 6496
    h. Swell Index (bentonite): ASTM D 5890
    i. Residual Shear Strength (1 sample only): ASTM D 6243
2. The test results shall be evaluated according to ASTM D-4759.

100-1.03.7 ACCEPTANCE

A. Contractor shall retain ownership of and responsibility for GCL until acceptance by the Owner.

B. Owner will accept GCL installation when:

1. All required documentation from the Manufacturer and Installer has been received and accepted.
2. Test reports verifying material properties have been received and accepted.
3. The CQA Monitor has completed final inspection and any noted defects have been repaired.
4. Geomembrane is installed and covered.
5. The Engineer has approved the Contractor’s as-built drawings required by Section 100-1.01.4.

6. The Operations Layer has been installed, the Geoelectric Leak Location Consultant has completed the geoelectric leak location survey, and any defects in the Geomembrane have been repaired by the Installer and repairs have been approved by the CQA Monitor.

100-1.04 MEASUREMENT AND PAYMENT

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

100-2 HIGH DENSITY POLYETHYLENE GEOMEMBRANE

100-2.01 GENERAL

The high density polyethylene (HDPE) Geomembrane liner to be furnished and installed under this contract shall conform to the requirements outlined herein along with the accompanying geosynthetics quality assurance plan. The Geomembrane liner shall be manufactured in the largest widths and lengths possible to minimize the number of field seams.

The HDPE Geomembrane liner shall be textured on one side and smooth on the other. The Geomembrane **liner shall be placed with the textured side down against the GCL and the smooth side up.**

100-2.01.1 SUMMARY

A. This section includes furnishing and installing 60-mil textured high density polyethylene (HDPE) Geomembrane

B. Related Sections:

1. Section 19-4 – Landfill Earthwork
2. Section 100-1 - Geosynthetic Clay Liner
3. Section 100-3 - Geocomposite
4. Section 100-4 - Geotextile
5. Section 100-5 - Operations Layer
6. Section 100-6 - Protective Plywood Cover
7. Section 100-7- Geoelectric leak location survey support

100-2.01.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D 1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
2. ASTM D 1238 - Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
3. ASTM D 1505 – Standard Test Method for Density of Plastics by the Density-Gradient Technique.
4. ASTM D 1603 – Standard Test Method for Carbon Black in Olefin Plastics
5. ASTM D 3895 – Standard Test Method for Oxidative Induction Time of Polyolefins by Thermal Analysis

6. ASTM D 4218 - Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
7. ASTM D 4437 – Standard Practice for Non-destructive Testing (NDT) for Determining the Integrity of Seams Used in Joining Flexible Polymeric Sheet Geomembranes.
8. ASTM D 4759 - Standard Practice for Determining the Specification Conformance of Geosynthetics.
9. ASTM D 4833 - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.
10. ASTM D 5321 – Standard Test Method for Determining the Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear.
11. ASTM D 5397 - Evaluation of Stress Crack Resistance of Polyethylene Geomembranes Using Notched Constant Tensile Load Test.
12. ASTM D 5596 – Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black Polyolefin Geosynthetics.
13. ASTM D 5617 - Standard Method for Multi-Axial Tension Test for Geosynthetics.
14. ASTM D 5721 – Standard Practice for Air-Oven Aging of Polyolefln Geomembranes.
15. ASTM D 5885 – Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High Pressure Differential Scanning Calirometry.
16. ASTM D 5994 - Test Method for Measuring the Core Thickness of Textured Geomembranes
17. ASTM D 6243 - Standard Test Method for Determining the Internal and Interface Shear Strength of Geosynthetic Clay Liner by the Direct Shear Method.
18. ASTM D 6392 - Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.
19. ASTM D 6693 – Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes.
20. ASTM D 6747 – Standard Guide for Selection of Techniques for Electrical Leak Location of Leaks in Geomembranes.
21. ASTM D 7002 – Standard Practice for Electric Leak Location on Exposed Geomembrane Using the Water Puddle Method.
22. ASTM D 7007 – Standard Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earthen Materials.
23. ASTM D 7466 – Standard Test Method for Measuring Asperity Height of Textured Geomembrane.
24. ASTM D 7909 – Standard Guide for Placement of Blind Actual Holes during Electrical Leak Location Surveys of Geomembranes.

B. Construction Quality Assurance (CQA) Plan For Phase III - Modules 9 & 10 Excavation and Liner System Construction, American Avenue Disposal Site..

100-2.01.3 DEFINITIONS

A. Batch: A quantity of resin, usually the capacity of one railcar, used in the fabrication of high density polyethylene (HDPE) Geomembrane sheet. The finished sheet will be identified by a roll number corresponding to the particular quantity of resin used.

B. Bridging: The condition when Geomembrane becomes suspended over its subgrade due to contraction of the material or poor installation.

C. Construction Quality Assurance (CQA) Consultant: The party, independent from County or Contractor, that is responsible for observing and documenting activities related to the quality of material manufacturing, material installation, and other construction activities related to the project. Also responsible for issuing a CQA report sealed by a Professional Engineer registered in the State of California

D. Construction Quality Assurance (CQA) Laboratory: A laboratory selected by the CQA Consultant independent from the Engineer, Contractor, Manufacturer, Fabricator and Installer, responsible for conducting laboratory tests on samples of materials obtained at the site. Also referred to as the Geosynthetics Laboratory.

E. Construction Quality Assurance (CQA) Officer: A civil engineer, registered in the State of California as required by 27 CCR 20324(b)(2), who is responsible for implementing the CQA Plan, observing, verifying, and documenting the construction and for preparing, signing, and certifying the Construction Completion Report. Also referred to as the CQA Engineer. Construction Quality Assurance (CQA) Monitor: Site representative of the CQA Engineer responsible for documenting field observations and tests.

F. Engineer: Director of the Department of Public Works and Planning of Fresno County, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

G. Extrudate: The molten polymer which is emitted from an extruder during seaming using either extrusion fillet or extrusion flat methods. The polymer is initially in the form of a ribbon, rod, bead, or pellets.

H. Fabricator: The party responsible for the fabrication of Geomembrane panels constructed from rolls received from the manufacturer.

I. Fishmouth: An opening resulting from the uneven mating of two Geomembranes where the upper sheet has excessive length that prevents it from being bonded flat to the lower sheet.

J. Geomembrane Manufacturer (Manufacturer): The party responsible for the production of the Geomembrane rolls from resin and for the quality of the resin.

K. Geomembrane: A polymeric sheet material that is impervious to liquid, also referred to as flexible membrane liner, membrane, or liner. Geomembrane Subgrade: The soil or geosynthetic surface on which the Geomembrane lies.

L. Installer: The Installer is responsible for proper installation of the geosynthetic components in accordance with the Drawings and Specifications. The Installer may be affiliated with the Manufacturer. Also called the Geosyntec Installer. .

M. Geoelectric Leak Location Consultant: Consultant with specific expertise in performing electric leak location surveys on exposed or covered geomembrane. Panel: The unit area of Geomembrane that will be seamed in the field. If the Geomembrane is not fabricated into panels in a factory, a panel is identified as a roll or portion of a roll without any seams.

N. Owner: County of Fresno

100-2.01.4 SUBMITTALS

A. Qualifications (Manufacturer): The Contractor shall submit information necessary to evaluate the Manufacturer's qualifications in accordance with Section 100-2.01.5 of these Special Provisions at least 21 calendar days prior to ordering the material. Material shall not be ordered by the Contractor until the Manufacturer's qualifications have been reviewed and approved in writing by the Engineer.

B. Qualifications (Installer): The Contractor shall submit information necessary to evaluate the Installer's qualifications in accordance with Section 100-2.01.5 of these Special Provisions at

least 21 calendar days prior to installation of the material. The submittal shall include the name of Installer and the names and resumes of the installation supervisor/field design engineer and the master seamer to be assigned to the project.

C. Equipment and Personnel – The Installer shall submit the following 14 calendar days prior to installation:

1. Equipment list stating quantity and types to be used.
2. List of personnel to perform field seaming operations.
3. Sample warranties for installation and material for the Engineer and the Owner to review.

D. Schedules and Drawings - The Installer shall submit the following 14 calendar days prior to installation of the Geomembrane:

1. An installation schedule which Includes hours to be worked per day, week and per shift, approximate starting time for each shift and when work will proceed at night (if applicable) and which indicates all weather delay built into schedule.

2. Installation layout drawings which show the panel layout and which indicate both fabricated (if applicable) and field seams, and details not conforming to the Plans. Upon acceptance by Engineer, the Installer shall use these drawings as the basis for installation of Geomembrane.

E. Product Data (Manufacturer): The Contractor shall submit the following 7 calendar days prior to shipping material to the site:

1. Resin Data:

   a. Certification stating that the resin meets the product requirements (Section 100-2.02.2).

   b. Copy of quality control certificates issued by Manufacturer. The data submitted on the resin shall include production dates and the results of conformance tests described in Section 100-2.02.2. The submittals for the resin shall also include a statement that no reclaimed polymer was used and that all resin is from the same supplier.

2. Geomembrane Roll:

   a. An instruction manual which includes the proper storage, handling, deployment, and seaming of the Geomembrane. This manual shall be in compliance with these Special Provisions, the quality assurance plan, and any conditions of warranty.

   b. Laboratory test results and certification stating that the Geomembrane meets the product requirements (Section 100-2.02.3).

   c. Copy of quality control certificates issued by Manufacturer. The quality control certificates shall include the production date and the laboratory results from the supplier demonstrating compliance with the Geomembrane specifications described in Section 100-2.02.3. Certification shall also be provided which states that the liner rolls are from the same supplier and that no reclaimed polymer was added.

   d. Sample warranties for review.

   e. Roll length and width.

3. Extrudate Beads and/or Rod.

   a. Laboratory certification stating that the extrudate meets the product requirements (Section 100-2.02.4).

   b. Copy of quality control certificates issued by Manufacturer.

   c. Certification stating that the extrudate bead or rod resin is the same type, from the same manufacturer and compatible with the resin used to manufacture the Geomembrane supplied for this project.

F. Field Quality Control Documents (Installer).

1. The Installer shall submit, prior to the start of installation, a subgrade acceptance certificate signed by the installation supervisor for each area to be covered by the Geomembrane.
2. The Installer shall submit quality control documentation prepared during installation before demobilizing.

H. The Installer shall submit the following upon completion of the installation:

1. A certification stating that the Geomembrane has been installed in accordance with the Plans and the Special Provisions.
2. The Manufacturer's product warranty.
3. The Contractor's installation warranty.
4. Reproducible as-built drawings showing the location of panels, seams, repairs, patches, and destructive samples, including measurements. The Installer shall prepare as-built drawing on D-size sheets to a scale approved by the Engineer. The medium upon which the drawings are printed shall be approved by the Engineer. The drawings shall include a title block, project name, name of Installer, name and signature of the person preparing the drawings, and the date of drawing preparation. The drawings shall also be furnished in AutoCAD format on a CD.
5. Seam test results.

100-2.01.5 QUALIFICATIONS

A. The Manufacturer of the Geomembrane material shall manufacture the material in the United States or in Canada and shall have previously demonstrated the ability to produce this Geomembrane by having successfully manufactured a minimum of ten million square feet of similar Geomembrane material for landfill lining installations. A list of similar projects completed in which the manufactured material has been successfully used shall be submitted.

B. The Installer of the lining material shall have previously demonstrated the ability to install this Geomembrane by having successfully installed a minimum of five million square feet of similar Geomembrane material for landfill lining installations. The Installer shall be capable of providing at least one seaming supervisor, present on the site at all times when seaming operations are being conducted, whose experience includes a minimum of 5 million square feet of liner installation using the seaming device used at the site. A list of projects completed by the Installer in which similar product has been successfully installed shall be submitted.

100-2.01.6 QUALITY ASSURANCE

A. The Owner shall engage and pay for the services of a Leak Location Consultant for conducting a geoelectric leak location survey of Geomembrane material being installed.

B. The Owner will engage and pay for the services of a CQA Consultant and a CQA Laboratory for monitoring the quality and installation of Geomembrane material being installed unless otherwise specified.

C. The Manufacturer shall allow the Engineer and Construction Quality Assurance Monitor (CQA Monitor) to visit the Geomembrane manufacturing plant prior to the manufacturing of the Geomembrane for this project, if such a visit is considered by the Engineer to be necessary to assure the quality of the liner material and its manufacturing. The manufacturing plant visit will be documented by the CQA Monitor. The purpose of the visit will be to:

1. Observe the manufacturing process for the Geomembrane.
2. Review plant quality assurance laboratory and establish protocols for conformance testing with the third party laboratory.

3. Observe conformance testing and establish specific conformance values.

C. Neither the Contractor nor the Manufacturer will charge any time, material, or other expenses to the Owner related to a plant visit by the Engineer, the CQA Monitor or designated representative.

D. The Contractor shall render assistance as necessary for the CQA Monitor to collect product samples and perform testing in accordance with the CQA Plan.

E. Geomembrane shall not be shipped to the site until conformance testing has been completed and the test results are determined to comply with the Specifications. If geomembrane is shipped prior conformance testing has been completed and the test results are determined to not comply with the Specifications, it will be at the Contractor's risk and the Contractor assumes all responsibility for the handling of geomembrane that is determined to ultimately not comply with the Specifications.

F. Should the Contractor choose to have geomembrane shipped to the site before conformance testing has been completed and the test results are determined to not comply with the Specifications, the geomembrane shall be stored separate from geomembrane that has been determined to comply with the Specifications.

G. Conformance test results will be reviewed consistent with ASTM D 4759- Procedure B. If a test result is in non-conformance with the Specifications, all material from that individual lot sampling unit represented by the failed conformance test shall be catalogued as "failed" or non-conforming. Any individual lot sampling unit which fails initial testing shall be retested for all the methods which did not meet the acceptable Specification values. If the average of both tests for any initially non-conforming methods, confirm that the individual lot sampling unit is non-conforming, then the individual lot sampling unit failing the acceptable specification value need to be rejected. Individual lot sampling units before and after the failed individual lot sampling unit or units in the lot will be resampled and retested for all applicable testing methods ("blocking tests"). Finally, the sequence of non-conforming individual lot sampling units in the lot shall be bounded/delineated by passing individual lot sampling units ("blocking tests"). Additional tests and replaced material will be provided at no additional cost to the Owner.

100-2.01.7 DELIVERY, STORAGE, AND HANDLING

A. General: The Contractor shall be responsible for transporting, unloading, and storing the Geomembrane and shall conform to the Manufacturer's requirements and these Special Provisions. Folding of Geomembrane material is not permitted; folded material will be rejected.

B. Delivery (Manufacturer and Installer).

1. The Contractor shall deliver Geomembrane to the site only after the Engineer accepts required submittals.

2. The Contractor shall notify the Engineer in writing 48 hours in advance of delivery of the Geomembrane. Material deliveries will not be allowed on-site unless and until submittals pertaining thereto which are required prior to delivery have been reviewed and accepted and advance written notice of delivery has been provided to the Engineer in accordance with these Special Provisions.

3. The Installer shall separate damaged rolls from undamaged rolls and store at locations designated by the Engineer until proper disposition of material is determined by Engineer.

4. The Contractor shall deliver the material in rolls and shall not fold the material.

C. Storage on Site - The Installer shall:

1. Store rolls in the space allocated by the Engineer.

2. Store rolls to protect from puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat or other damage.

3. Store rolls on prepared surface (not on wooden pallets).

4. Stack no more than three rolls high.

D. Handling on Site - The Installer shall:

1. Use appropriate handling equipment to load, move, or deploy Geomembrane rolls. Appropriate handling equipment includes cloth chokers and spreader bar for loading, spreader and roll bars for deployment. Dragging panels on ground surface will not be permitted.
2. Folding of Geomembrane material is not permitted; folded material will be rejected.
3. Off load and store material at the storage area.
4. Transport material from the storage area to the installation site upon commencement of installation.

E. Damaged Geomembrane

1. Damaged Geomembrane will be documented by the CQA Monitor and the Installer.
2. The Installer shall repair damaged Geomembrane, if repair in lieu of rejection of the material is approved by the Engineer, in accordance with these Specifications.
3. If material is rejected by the Engineer, the material shall be replaced by the Contractor at no cost to the Owner.

100-2.01.8 WARRANTY

A. The Contractor shall provide a Manufacturer's Warranty for Geomembrane material in compliance with the requirements of these Special Provisions. The Manufacturer's Warranty shall:

1. Provide a minimum 20-year warranty for the Geomembrane material against deterioration due to buried exposure.
2. Cover the costs of Geomembrane material replacement and installation; assuming the area is in a clean, dry, unencumbered condition. In the event the area cannot be rendered as such, compensation for defective material will be provided to the Owner on a pro rata basis for the estimated cost to the Owner at that time of supplying and installing material to a clean, dry, and unencumbered condition by a third-party installer.

B. The Contractor shall provide an installation warranty for Geomembrane material in compliance with the requirements of these Special Provisions. The installation warranty shall provide a minimum of 2 year non-prorated warranty for the installation against defects.

100-2.02 PRODUCTS

The materials described under this section include Geomembrane resin, Geomembrane rolls, and the extrudate rod or beads used in the extrusion welding process. The Contractor shall provide the appropriate submittals as described in Section 100-2.03, Submittal of Engineering Data of these Special Provisions.

100-2.02.1 MANUFACTURERS

Material shall be provided by a Manufacturer meeting the qualification requirements in Section 100-2.01.5 or by a distributor approved by a qualified Manufacturer.

100-2.02.2 GEOMEMBRANE RESIN

The resin supplied for the Geomembrane shall conform to the following requirements:

A. Resin shall be High Density Polyethylene (HDPE), first quality, compounded, and manufactured specifically for producing polyethylene Geomembrane.

B. Resin types shall not be mixed during manufacturing.

C. Resin shall not be manufactured with recycled materials.

D. Resin shall be compatible with existing in-place Geomembrane resin as determined by destructive seam tests (if applicable).

E. Resin shall conform with the requirements in Table 100-2A.

Table 100-2A
Properties of HDPE Resin

Test	Test Designation	HDPE
Specific Gravity	ASTM D 1505	0.932 g/cc(1) min. avg.
Melt Index	ASTM D 1238	1 g per 10 min. max avg
1. Measure on pure resin without additives.		

100-2.02.3 GEOMEMBRANE ROLLS

The Geomembrane shall be composed of new, first quality HDPE manufactured and designed specifically for the purpose of liquid containment and shall conform to the following requirements:

A. Shall be produced in the United States or Canada. Material from other sources may be used only with prior written approval by the Engineer.

B. The combined total weight of all additives other than carbon black or pigment shall not exceed 1.5 percent of the weight of the finished Geomembrane.

C. The quantity of processing aids, antioxidants, and other additives as a percentage of the weight of the finished Geomembrane shall be documented and included on the quality control certificates.

D. The combined total weight of all additives including carbon black and pigment shall not exceed 4.0 percent of the weight of the finished Geomembrane.

E. All additives for UV protection, thermal stability, color, texturing, or processing agents shall be evenly dispersed within the material and shall not "bloom" to the surface over time or inhibit welding.

F. The finished product shall be free from blemishes, holes, pin holes, bubbles, blisters, excessive gels, undispersed resins or undispersed carbon black, contamination by foreign matter, and nicks or cuts on edges.

G. Each roll shall be identified with labels indicating roll number, thickness, length, width, and Manufacturer.

H. Geomembrane shall be textured on one side and smooth on the other side.

I. The geomembrane shall be manufactured with a minimum 15-foot seamless width. There shall be no factory seams.

J. Geomembrane shall conform with the requirements in Table 100-2B and in Table 100-2C.

Table 100-2B

Properties for High Density Polyethylene Geomembrane

Test	Test Designation	Requirement [1]
Sheet Thickness	ASTM D 5994	60-mils [2]
Asperity Height	ASTM D 7466	20 mil min. avg.
Specific Gravity	ASTM D 792, Method B	0.940 g/cc min. avg.
Tensile Properties[3]	ASTM D 6693, Type IV	
• Tensile Strength at Yield		132 lb/in min. avg.
• Tensile Strength at Break		132 lb/in min. avg.
• Elongation at Yield [3]		12% min. avg.
• Elongation at Break [3]		100% min. avg.
Tear Resistance	ASTM D 1004	45 lb min. avg.
Puncture Resistance	ASTM D 4833	120 lb min. avg.
Oxidation Induction Time	ASTM D 3895	See Notes [4]
Stress Crack Resistance [5]	ASTM D 5397	500 hours @ 30% of yield stress min. avg.
Carbon Black Content	ASTM D 4218	2% to 3%
Carbon Black Dispersion	ASTM D 5596	See Notes [6]
Oven Aging at 85°C	ASTM D 5721	See Notes [7]
UV Resistance	ASTM D 5885	50% [8] min. avg.
Direct Shear	ASTM D 6243 [9]	See Table 100-2C
	ASTM D 5321 [10]	See Table 100-2C

Table 100-2B

Properties for High Density Polyethylene Geomembrane

Continued

	Notes:
(1)	Determine conformance according to ASTM D 4759. The values listed in the table above are to be interpreted according to the designated test method. In this respect, they are neither minimum average roll values nor maximum average roll values.
(2)	Nominal thickness. Thickness measurement does not include texturing. Lowest individual value for 8 out of 10 values shall be 54 mils. Lowest individual value for any of the 10 values shall be 51 mils.
(3)	Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens in each direction. Yield elongation shall be calculated using a gage length of 1.3 inches. Break elongation shall be calculated using a gage length of 2.0 inches.
(4)	Minimum average of 100 minutes using ASTM D 3895 or minimum average of 400 minutes using ASTM D 5885.
(5)	P-NCTL test is not appropriate for testing geomembrane with textured or irregular rough surfaces. Test should be performed on smooth edges of textured rolls or on smooth sheets made from the same formulations as being used for the textured sheet materials. The yield stress used to calculate the applied load for the SP-NCTL test should be the Manufacturer's mean value determined from Manufacturer's quality control testing.
(6)	Carbon black dispersion (only near spherical agglomerates) for 10 different views: 9 in Categories 1 or 2, and 1 in Category 3.
(7)	Minimum average retention of 55% after 90 days if using ASTM D 3895 or 80% after 90 days if using ASTM D 5885.
(8)	The condition of the test should be 20 hours UV cycle at 75°C followed by 4 hours condensation at 60°C.
(9)	Requirements for shear strength of Geomembrane and GCL interface and internal shear strength of GCL. Further requirements are listed in Table 100-2C.
(10)	Requirements for shear strength of Geocomposite and 60 mil HDPE Geomembrane interface. Further requirements are listed in Table 100-2C.

Table 100-2C

Interface Strength Requirements for Liner System

Test	Test Designation	Normal Load (psf)	Minimum Residual Shear Strength (psf)[1]
Residual Shear Strength	ASTM D 6243 [2]	2,500 5,200 7,500	500 1,000 1,000
	ASTM D 5321 [3]	2,500 5,200 7,500	500 1,000 1,000

1 Residual shear strength is the lowest measured value between displacement at the peak shear stress and at 3 inches.

2 Requirement applies to (1) Upper Surface of GCL / Textured Lower Surface of Geomembrane, and (2) Lower Surface of GCL / Subgrade. Multiple interfaces can be tested at the same time. The soil samples to be used for shear strength testing shall be fabricated from on-site soil with a minimum relative compaction of 95 percent of the D-1557 test maximum dry density (unit weight) and with a moisture content of 2 percent above the D-1557 test optimum moisture content. The actual moisture content may be revised on the basis of the D-1557 test results for each material. The direct shear strength tests will be performed by saturating the GCL and soil under a normal load of 125 psf for a minimum period of 48 hours, applying a normal load, and shearing the specimen at the normal loads shown. Incrementally load the test specimen at 1,000 psf per minute until specified normal load is reached. The sample shall be sheared using a constant strain rate of 0.04 inches per minute. The residual shear strength shall be measured at 3.0 inches of displacement.

3 Applies to Geocomposite / 60 mil HDPE Geomembrane interface. The test specimen shall be sheared at a constant rate of 0.2 inch per minute. The residual shear strength shall be measured at 3.0 inches of displacement.

100-2.02.4 EXTRUDATE ROD OR BEAD

Extrudate rod or bead shall:

A. Meet the Geomembrane Manufacturer requirements.

B. Be made from same resin as the Geomembrane.

C. Be from the same supplier as the Geomembrane.

D. Thoroughly disperse additives throughout rod or bead.

E. Contain 2 to 3 percent carbon black.

F. Be free of contamination by moisture or foreign matter.

100-2.02.5 WELDING EQUIPMENT

The Installer shall:

A. Utilize welding equipment which is equipped with gages showing temperatures both in the apparatus and the nozzle (extrusion welder) or at one wedge (wedge welder).

B. Maintain sufficient operational seaming apparatus to continue work without delay.

C. Use a power source for welding equipment which is capable of providing constant voltage under combined line load.

D. Do not locate electric generators on the lining unless approved in writing by the Engineer.

E. Provide tensiometers capable of measuring seam strength, calibrated and accurate within 2 pounds.

F. Provide dies for cutting seam samples.

100-2.02.6 PIPE BOOTS

A. Pipe boots shall be manufactured from material with the same sheet density and nominal thickness as the Geomembrane to which they are being welded.

B. Pipe boots shall be shop fabricated of non-textured Geomembrane material. The Contractor shall provide a Manufacturer's statement of hydraulic or pneumatic testing of the fabricated boots prior to acceptance.

C. The Installer shall minimize liner penetrations to areas where they are absolutely necessary to boot around existing pipes.

D. The Installer shall thoroughly and securely seal penetrations though the Geomembrane. The seal between the Geomembrane and pipe shall be without detectable leakage.

E. Where clamps, fasteners, gaskets, seals or sealants are used, the Installer shall use only materials which are compatible with the Geomembrane and the pipe.

100-2.02.6 MANUFACTURER SOURCE QUALITY CONTROL

The manufacturer shall perform the following quality control tests at the manufacturing plant or Contractor laboratory on Geomembrane products.

Table 100-2D
Testing Frequencies

Test	Test Designation	Frequency (see Notes)
Sheet Thickness	ASTM D 5994	A
Asperity Height	ASTM D 7466	E
Specific Gravity	ASTM D 792, Method B	B
Tensile Strength at Yield	ASTM D 6693, Type IV	C
Tensile Strength at Break	ASTM D 6693, Type IV	C
Elongation at Yield	ASTM D 6693, Type IV	C
Elongation at Break	ASTM D 6693, Type IV	C
Tear Resistance	ASTM D 1004	D
Puncture Resistance	ASTM D 4833	D
Oxidation Induction Time	ASTM D 3895	B
Stress Crack Resistance	ASTM D 5397	B
Carbon Black Content	ASTM D 4218	C
Carbon Black Dispersion	ASTM D 5596	C
Oven Aging at 85°C	ASTM D 5721	F
UV Resistance	ASTM D 5885	F

Notes:

A. Ten tests per roll.

B. One per 200,000 square feet of sheet produced or one per resin batch, whichever results in the greater number of tests.

C. One per 20,000 square feet of sheet produced or one per resin batch, whichever results in the greatest number of tests.

D. One per 45,000 square feet of sheet produced or one per resin batch, whichever results in the greatest number of tests.

E. One per every second roll.

F. One per formulation

G.

100-2.03 EXECUTION

100-2.03.1 EXAMINATION OF SUBGRADE

A. The Installer shall inspect the subgrade (GCL) and submit a written acceptance of subgrade to the CQA Monitor prior to beginning deployment.

B. The Installer shall notify the CQA Monitor in writing if the surface on which the Geomembrane will be installed is not acceptable.

C. In the event that the Installer begins deployment without providing written acceptance of the subgrade (GCL), said commencement of deployment shall be considered to constitute the Installer's acceptance of the subgrade condition.

D. All grade changes shall be rounded to a minimum 6-inch radius.

100-2.03.2 PREPARATION

The Contractor shall:

A. Repair damage caused to underlying subgrade during geosynthetics deployment.

B. Round edges of anchor trenches or cushion with Geotextile.

C. Perform trial seam welds in accordance with the following:

1. Trial seam welds shall be performed on samples of Geomembrane to verify the performance of welding equipment, seaming methods, and conditions.

2. No seaming equipment or welder will be allowed to perform production welds until equipment and welders have successfully completed trial welds.

3. Frequency of trial welds:

   a. At the start of the seaming period.

   b. Once every four hours of seaming.

   c. When directed by the CQA Monitor.

   d. Every 2 hours when using a wedge weld to weld across seams.

   e. Minimum one trial weld per person per shift.

   f. Minimum one trial weld per seaming device per shift.

   g. When ambient temperature changes more than 18°F (10°C) since previous trial weld.

4. Make trial welds in the same surroundings and environmental conditions as the production welds.

5. Make trial weld sample at least 2 feet long for welding methods other than double wedge welding. Make trial weld sample 3 feet long for double wedge welding machines.

6. Cut 2, 1-inch wide test strips from opposite ends of the trial weld (4 strips total).

7. Quantitatively test specimens, first for peel adhesion, and then for bonded seam strength (shear) (ASTM D 4437).

   a. A specimen is considered passing when the following results are achieved.

      1) The break is a film tearing bond (FTB).

      2) The break is ductile.

      3) The peel strength is 70 percent minimum of the specified sheet yield strength peel test for wedge welded or flat welded seams.

      4) There is no more than 10 percent separation of the weld. For wedge welds the width of the weld must be equal to the width of the hip roller.

5) The shear strength is 100 percent of the specified sheet yield strength for shear test for all weld types. When testing set grips back 2 inches from the edge of the weld. Minimum elongation between the grips must be 2 inches.

b. A trial weld sample is considered passing when both specimens pass peel and shear tests. For double-wedge welding, both welds must pass in peel.

8. Repeat the trial weld in its entirety when any of the trial weld samples fail in either peel or shear.

9. If repeated test welds fail, the welding technician or apparatus shall not be used until the reasons for the failing values are identified and corrected and two consecutive successful trail welds are achieved.

100-2.03.3 INSTALLATION

Installation of the Geomembrane shall be performed by an Installer meeting the qualification requirements of these Special Provisions.

100-2.03.4 PLACEMENT OF THE GEOMEMBRANE

The Geomembrane shall be placed by the Installer in accordance with the panel layout drawing submitted by the Installer and in conformance with the following requirements:

A. Deployment

1. **Geomembrane shall be placed with the textured side down against the GCL and the smooth side up.**

2. The Installer shall give careful consideration to the timing and temperature during deployment. The CQA Monitor will focus on verifying that (a) there is no bridging or stresses in the Geomembrane and (b) there are no wrinkles in the Geomembrane that will fold over when covering with soil material. Ideally, deployment, welding, and covering would all occur at the same temperature. The Installer shall strive to perform these activities within as narrow a temperature range as practical, and shall avoid performing these activities during peak hot or cold conditions.

3. The Installer shall place liner panels continuously down the slopes. Transverse joints between panels shall be made at the base of the slopes and shall be located a minimum of six feet from the toe of the slope and a minimum of five feet from the nearest edge of the leachate collection trench.

4. The Installer shall label each panel with a unique identification number or code consistent with the Installer's submitted panel layout drawing. The coding is subject to approval by the CQA Monitor.

5. The Installer shall not deploy more panels in one shift than can be welded or secured during that same day.

6. The Installer shall not deploy in the presence of excessive moisture, precipitation, ponded water, or high winds.

7. The Installer shall ensure that the Geomembrane is not damaged by handling, trafficking, leakage of hydrocarbons, or any other means.

8. The Installer shall place the liner using methods and equipment that do not damage it, the GCL, or the subgrade. Personnel working on the liner shall not smoke, nor wear shoes that potentially could damage the Geomembrane, nor engage in other potentially damaging activities. No vehicles shall be allowed to directly drive over exposed GCL and exposed Geomembrane.

9. Installer shall be responsible for staging the Work so that no construction equipment needs to be driven over already deployed GCL panels while deploying subsequent geomembrane panel or subsequent geosynthetics (geocompositet).

10. Equipment used for placing soils shall not be driven directly over geosynthetics. A minimum thickness of 1 ft (300 mm) of material is required between a low ground pressure (LGP) dozer and underlying geosynthetics. A minimum thickness of 3 ft of material is required between rubber-tired vehicles and underlying geosynthetics. In areas of heavy vehicle traffic, such as access ramps, the material thickness should be at least 3 ft. In any case, the following table shall be complied with during construction:

11.

Maximum Allowable Equipment Ground Pressure (psi)	Initial Lift Thickness Over Geosynthetics (feet)
5	1.0
10	1.5
15	2.0
>20	>3.0

12. The Installer shall unroll Geomembrane panels using methods that will not damage, stretch or crimp Geomembrane, and shall protect the underlying surface from damage.

13. The Installer may use a sacrificial Geomembrane slip plane between the Geomembrane and GCL if deploying Geomembrane over GCL becomes difficult due to the Geomembrane adhering to the GCL. The Installer shall remove any sacrificial slip plane immediately after deployment is completed.

14. The Installer shall use methods that minimize wrinkles and differential wrinkles between adjacent panels, and shall allow panels to come to the same approximate temperature before seaming.

15. The Installer shall Secure Geomembrane during deployment by placing sandbags as ballast.

16. The Installer shall fill sandbags with the same material as that which is used for the Operations Layer.

17. The Installer shall maintain ballast in place until the Geomembrane is covered.

18. The Installer shall protect Geomembrane in areas of heavy traffic by placing protective cover which is compatible with and will not cause damage to the Geomembrane.

19. The Installer shall remove protective cover prior to the performance of geoelectric leak location survey by the Geoelectric Leak Location Consultant.

20. The Installer shall repair damage to subgrade or other underlying materials prior to completing deployment of Geomembrane.

21. The Installer shall remove heavily wrinkled or folded material.

22. The Installer shall visually inspect the liner material as it is deployed and shall mark any defects for repair. If a significant number of defects are identified as determined by the CQA Monitor, the material shall be removed and replaced by the Contractor at no expense to the Owner.

23. The Installer shall install material to account for shrinkage and contraction to avoid wrinkles.

24. The Installer shall install material in an unstressed configuration with no bridging.

25. Before wrinkles fold over, the Installer shall attempt to push them out. In the event that wrinkles cannot be pushed out, the Installer shall remove wrinkles by cutting and subsequent repair as directed by the CQA Monitor.

B. Seam Layout – the Installer shall:

1. Orient seams parallel to line of a maximum slope, i.e., orient down not across slope.
2. Minimize the number of field seams in corners and in irregularly-shaped geometric locations.
3. Use a seam numbering system which is compatible with the panel number system.
4. Overlap the Geomembrane panels a minimum of three inches for extrusion welding and four inches for fusion welding.

100-2.03.5 SEAMING OF THE GEOMEMBRANE

A. Seam Welding Personnel – the Installer shall:

1. Provide at least one welder (master welder) who has experience welding over 5 million square feet of Geomembrane using the same type of welding apparatus to be used at the site. The master welder will provide direct supervision over other welders.
2. Provide experienced personnel to perform welding operations who have successfully passed field welding tests performed on site.
3. Do not begin seaming operations until each welding technician and apparatus used in the field has passed test welds in accordance with these Special Provisions.
4. Provide a minimum of two welders including the master welder.

B. Seam Welding Equipment:

1. The Contractor shall provide and use a power source capable of providing constant voltage under combined line load to power the seam welding equipment.
2. Extrusion welders shall be equipped with gauges showing temperatures in extruder apparatus and at nozzle. The temperature at nozzle may be measured by external temperature gauges.
3. Hot wedge welders shall be self-propelled variable speed machines equipped with devices to measure and adjust wedge temperature. Pressure shall be controlled by springs, pneumatics, or other systems that allow for variations in sheet thickness. Rigid frame fixed position equipment shall not be used.
4. The Installer shall provide and maintain welding apparatus of sufficient quality to perform work on schedule.

C. Test welding procedures – the Installer shall follow test welding procedures described in Section 100-2.03.2

D. General welding procedures – the Installer shall:

1. Cut fishmouths or wrinkles along the ridge of the wrinkle in order to achieve a flat overlap. Extrusion weld the cut fishmouths or wrinkles where the overlap is more than 3 inches. When there is less than 3 inches overlap, patch with an oval or round patch extending a minimum of 6 inches beyond the cut in all directions.
2. Not commence welding with welding equipment or operators until a trial weld test sample, made by that equipment and operator, passes test.
3. Ensure that all welds extend for the full extent of the Geomembrane including that portion placed in the anchor trench.

4. Prior to welding, prepare the seams by cleaning the seam surface of any moisture, grease, dust, dirt, debris, or other foreign material and removing surface oxidation not more than a half hour before welding. The grinder shall be held parallel to the liner edge and any area where grinding removes more than 4 mils shall be patched.
5. Clean surface overlap panels a minimum 3 inches for extrusion and 4 inches for hot wedge welding.
6. Not use solvents or adhesives unless product is approved in writing by the Engineer.
7. Provide adequate material on weld to allow peel testing of both sides of double wedge weld.
8. Extend welding to the outside edge of all panels.
9. Provide a firm substrata for welding by using a flat board, a conveyor belt, or similar hard surface directly under the weld overlap.
10. Provide adequate illumination if welding operations are carried out at night.
11. Record the following information every two hours:
    a. Temperature directly on the Geomembrane surface being welded.
    b. Extrudate temperatures in barrel and at nozzle (extrusion welder).
    c. Operating temperature of hot wedge (hot wedge welder) and any pressure adjustments made.
    d. Preheat temperature.
    e. Speed of hot wedge welder in feet per minute.
12. Weld only when temperature measured on the Geomembrane is between 32°F (0°C) and 130°F (55°C). All seaming operations must cease when the Geomembrane temperature is outside this range. When the temperature is below 50 degrees Fahrenheit, provide preheating of the weld by a hot air device. Any seaming done below 40˚ F or above 120˚ F shall be allowed only after verification by the CQA Monitor that the material can be seamed according to the Special Provisions.
13. Discontinue operations temporarily as directed by the CQA Monitor if temperatures below 130°F result in excessive wrinkling in unseamed panels.

E. Defects and Repairs – the Installer shall:

1. Examine all welds and non-weld areas of the Geomembrane for defects, holes, blister, undispersed raw materials, and any sign of contamination by foreign matter. Ensure that the surface of the Geomembrane is clean at the time of the examination.
2. Repair and non-destructively test each suspect location both in weld and non-weld areas and shall not cover Geomembrane at locations which have been repaired until test results with passing values are available.

F. Extrusion Type of Welding – the Installer shall:

1. Use procedures to tack bond adjacent panels together that do not damage Geomembrane and which allow CQA tests to be performed.
2. Purge welding apparatus of heat-degraded extrudate before welding and after any work stoppages of more than three minutes.
3. Bevel top edges of Geomembrane a minimum of 45° for the full thickness of Geomembrane before extrusion welding.
4. Clean seam welding surfaces of oxidation by disc grinder with 80 grit sandpaper not more than 30 minutes before extruding weld. Change grinding discs frequently and shall not use clogged discs.

5. Not remove more than 4 mils of material when grinding.
6. Grind across, not parallel to, welds.
7. Cover entire width of grind area with extrudate.
8. Grind ends of all welds that are more than 5 minutes old when restarting welding.
9. Ensure that grind marks do not extend more than a quarter inch beyond the weld head.

G. Interface Extrudate Welding – the Installer shall:
1. Mount components necessary to weld on mobile unit.
2. Include the following accessories on mobile unit:
   a. Variable speed control.
   b. Wheels with non-skid surface.
   c. Directional control.
   d. Automatic hot air system for preheating welding surfaces.
   e. Extruder system with appropriate die.
   f. Adjustable contact pressure rollers.
3. Test and set hot air system using scrap material each day prior to commencing welding.
4. Adjust hot air velocity to negate wind effects.
5. Adjust contact pressure rollers to prevent surface ripples in panels.
6. Protect against moisture build-up between panels.

H. Hot Wedge Welding. – the Installer shall:
1. Place smooth insulating plate or fabric beneath hot welding apparatus after usage.
2. Protect against moisture build-up between panels.
3. Conduct field test welds at least every two hours if welding across cross seams, otherwise, once prior to start of work and once at mid-day.
4. Bevel edges of top and bottom panels on cross seams prior to welding .
5. Extrusion-weld a patch over all seam intersections.
6. Use the extrusion or single wedge fusion welding method if the double hot wedge welding process produces areas where air pressure testing of the seams can not be conducted with a vacuum box.

100-2.03.6 FIELD QUALITY CONTROL

A. General
1. The Manufacturer, Fabricator, and Installer shall participate in and conform with all terms and requirements of the Owner's quality assurance program. The Contractor is responsible for this participation.
2. The Installer shall designate a technician that is responsible for supervising and/or conducting the Installer's field quality control program.

B. Conformance Testing (Performed by CQA Laboratory).
1. The Installer shall allow 5 working days for conformance testing following the date material is available to the CQA Consultant.

2. The CQA Monitor shall have the following tests performed by the CQA Laboratory at a frequency of one per batch or one per 100,000 square feet of material supplied, whichever results in the greatest number of tests, to determine Geomembrane conformance with the requirements of these Special Provisions:

    a. Sheet Thickness (ASTM D 5994)

    b. Asperity Height (ASTM D 7466)

    c. Specific Gravity (ASTM D 1505)

    d. Tensile Properties (ASTM D6993)

    e. Tear Resistance (ASTM D 1004)

    f. Puncture Resistance (ASTM D 4833)

    g. Carbon Black Content (ASTM D1603)

    h. Carbon Black Dispersion (ASTM D5596)

3. Where optional procedures are noted in the test method, the requirements of these Special Provisions shall prevail.

4. Additional tests may be performed at the discretion of the CQA Monitor.

5. The Installer shall provide equipment and personnel to assist the CQA Monitor in obtaining samples in accordance with the following:

    a. The Installer shall sample across the entire width of the roll as directed by the CQA Monitor.

    b. The Installer shall cut samples 3 feet long by width of roll as directed by the CQA Monitor.

    c. The CQA Monitor shall mark the roll number, machine direction, and the date on which the sample was taken on each sample.

    d. Samples shall be taken at a rate of one per batch or one per 100,000 square feet of material supplied, whichever results in greatest number.

C. Conformance Testing (Performed by Geoelectric Leak Location Consultant and supported by the Contractor).

1. The Geoelectric Leak Location Consultant shall perform a geoelectric leak location survey. The survey will be performed in two phases. The first phase (ASTM D 7002) will be a “water puddle” survey performed on the installed Geomembrane before placing Geocomposite, and Operations Layer soil. The “water puddle” survey is typically conducted at night when the Geomembrane is taut. The first phase will be performed after all samples of Geomembrane required for destructive testing are obtained and the sample locations repaired. The second phase (ASTM D 7007) will be performed after placing the Geocomposite, and Operations Layer soil.

2. The Contractor shall provide support to the Geoelectric Leak Location Consultant as described in Section 100-7 of these Special Provisions.

3. As directed by the CQA Monitor, blind actual holes will be placed in the Geomembrane in accordance with ASTM D 7909 before conducting the survey as a quality control/quality assurance measure to ensure that leaks through the Geomembrane are detectable.

4. The Geoelectric Leak Location Consultant shall perform calibration testing with the blind actual hole on the Geomembrane. If a blind actual hole is not detected during the calibration testing, the hole will be repaired, and the Geomembrane resurveyed since the previous calibration test was inadequate.

5. The Contractor shall provide electrical isolation surrounding the area which will be geoelectric leak location surveyed prior to completion of phase two of the geoelectric survey. This typically includes foregoing the placement of Operations Layer Soils surrounding the entire area that will be surveyed at a minimum of 2 ft wide and have the geosynthetics still visible. The Geoelectric Leak Location Consultant shall perform the geoelectric leak location survey in accordance with either ASTM D 7002 or ASTM D 7007, as applicable. The Geoelectric Leak Location Consultant shall conduct the first phase of the geoelectric leak location survey such that any holes in the Geomembrane with a diameter of 0.2 inches or greater and any holes with an overall area of 0.03 square inches or greater are detected.

6. The Installer shall coordinate Geomembrane, Geocomposite, Geotextile, and Operations Layer placement with the Geoelectric Leak Location Consultant and the CQA Monitor. No Geomembrane shall be covered with any material before the "water puddle" liner leak location survey is performed. If the Installer wants to temporarily cover the Geomembrane before the liner leak location survey is performed, approval from the CQA Monitor shall be obtained before doing so.

7. The Contractor and Installer shall assist the Geoelectric Leak Location Consultant by providing equipment and personnel to assist the Geoelectric Leak Location Consultant in performing the liner leak location survey.

8. The Contractor shall install, at the direction of the Geoelectric Leak Location Consultant, at least two permanent electrodes in the soil liner or GCL located beneath the Geomembrane. The permanent electrodes must be installed before the installation of the Geomembrane. The permanent electrodes will be provided by the Leak Location Contractor.

9. The Geoelectric Leak Location Consultant shall provide an adequate power supply (110V, 5 A) for the liner leak location survey.

10. The Contractor shall provide two supervised laborers, or as requested by the Geoelectric Leak Location Consultant, with equipment to assist in laying out survey string lines and applying water to the Geomembrane.

11. The Installer shall repair all damage, holes, or defects in the Geomembrane identified by the Geoelectric Leak Location Consultant in accordance with these Special Provisions.

12. Placement of Geocomposite, and Operations Layer can proceed after successful completion of the liner leak location survey and repair of all damage, holes, and defects in the Geomembrane.

13. Full compensation for providing the Geoelectric Leak Location Survey Support as described in Section 100-7 for the first and second phases required for the Geoelectric Leak Location as described in the Specifications and throughout these Special Provisions and as directed by the Engineer, shall be paid for in the lump sum item for Geoelectric Leak Location Support, and no additional compensation will be allowed therefor.

D. Field Testing:

1. General: The Installer shall non-destructively test all field seams over their full length using a vacuum test unit, air pressure (for double fusion seams only), spark testing, or other approved methods. The Installer shall perform testing as the seaming progresses and not at the completion of all the field seaming. The Installer shall complete all required repairs in accordance with this specification.

2. Vacuum Testing

   a. Equipment for vacuum testing shall be comprised of the following:

      1) A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole, or valve

assembly, and a vacuum gauge. Box dimensions shall be small enough so that testing can be accomplished over odd-shaped surfaces.

2) A vacuum pump assembly equipped with a pressure control.

3) A rubber pressure/vacuum hose with fittings and connections.

4) A soapy solution and an applicator.

b. Vacuum test procedures – the Installer shall:

1) Wet the weld to be tested with a soapy solution prior to using the vacuum box.

2) Place the box over the wetted seam area.

3) Ensure that a leak-tight seal is created.

4) Energize the vacuum pump and reduce the vacuum box pressure to approximately 10 inches of mercury, i.e., 5 psi gauge.

5) Examine the Geomembrane through the viewing window for the presence of soap bubbles for a period of not less than fifteen seconds.

6) Test the next section of seam, if no bubbles appear, with a minimum of three inches of overlap with the previous section.

7) Mark and repair all areas where soap bubbles appear in accordance with repair procedures described in this specification.

3. Air pressure testing for seaming processes producing a double seam with an enclosed channel. If the double hot wedge welding system is used, air pressure testing shall be conducted instead of vacuum testing.

a. Equipment for air pressure testing shall be comprised of the following:

1) An air pump (manual or motor driven) capable of generating and sustaining a pressure over 30 psi and mounted on a cushion to protect the Geomembrane.

2) A rubber hose with fittings and connections.

3) A sharp hollow needle, or other approved pressure feed device.

4) A pressure gauge with an accuracy of one psi.

b. Air pressure test procedures – the Installer shall:

1) Seal both ends of the welded seam to be tested.

2) Insert needle or other approved pressure feed device into the tunnel created by the weld.

3) Energize the air pump to a minimum pressure of 1/2 psi per mil of liner thickness, close valve and sustain pressure for at least five minutes.

4) If loss of pressure exceeds two psi (ten mm mercury), or does not stabilize, locate faulty area and repair in accordance with repair procedures described in these Special Provisions.

5) Puncture opposite end of seam to release air. If blockage is present (air is not released), locate and test seam on both sides of blockage.

6) Remove needle or other approved pressure feed device and seal the penetration holes.

4. Spark Testing for penetrations or other difficult areas not accessible for vacuum testing.

a. Equipment for spark testing shall be comprised of the following:

1) 24 gauge copper wire.

2) Low-amperage electric detector, 20,000 to 30,000 volt, with brush-type electrode capable of causing visible arc up to 3/4 inch from copper wire.

b. Spark testing procedures – the Installer shall:

1) Place copper wire in the seam within 1/4 inch of the edge of extrusion seam or clamp seal.

2) Pass electrode over seam or clamp area and observe for spark. If a spark is detected perform a repair.

5. Destructive Testing (performed by CQA Monitor and the Installer).

a. Location and Frequency of Testing.

1) The Installer shall collect destructive test samples as the installation progresses.

2) The Installer shall repair any suspicious looking welds before release of a seam for destructive sampling.

3) The Installer shall assist the CQA Monitor by collecting destructive test samples at a minimum frequency of one test location per 500 feet of seam length per welding apparatus.

4) The Installer shall assist the CQA Monitor by collecting destructive test samples at a minimum frequency of one test location per 200 feet of seam length for seams between previously installed (more than 6 months previously) and new Geomembrane (if applicable).

5) The CQA Monitor will determine test locations during welding. The selection of test locations may be prompted by excess crystallinity or by suspicion of contamination, offset welds, or other defect. The CQA Monitor will not notify the Installer in advance of selecting locations where weld samples will be taken.

6) If the number of failed samples exceed 5 percent of the tested samples, the CQA Monitor may increase the test frequency. Samples taken as the result of failed tests do not count toward the total number of required tests.

b. Sampling Procedures.

1) The Installer shall cut samples at locations designated by the CQA Monitor. Destructive samples shall be cut as the installation progresses and not at the completion of the project. The Contractor shall verify that laboratory test results have been obtained before the Geomembrane is covered by another material.

2) The CQA Monitor will number each sample with consecutive numbers along with the seam number and will mark sample number and location in compliance with the CQA plan.

3) The Installer shall cut initial samples a minimum of 12 inches wide by 48 inches long with the seam centered lengthwise. The Installer shall then cut two one-inch wide strips from each end of the sample and test these for (shear and peel) in the field and shall cut the remaining sample into three parts for distribution as follows:

a. One portion for the Installer: 12 inches by 12 inches.

b. One portion for CQA Laboratory: 12 inches by 18 inches.

c. One portion to the OWNER for archive storage: minimum 12 inches by 12 inches.

4) The Installer shall repair all holes in the Geomembrane resulting from destructive test sampling the same day samples are taken in accordance with repair

procedures described in this section and shall test the continuity of the repair in accordance with this section.

6. Field Testing

   a. The CQA Monitor shall test the four, one-inch wide strips specified above by tensiometer for peel (2 strips, 1 from each end) and shear (2 strips, 1 from each end), respectively.

   b. The CQA Monitor shall ensure that the test strips meet peel and shear requirements for welded seams specified in Section 100-2.03.2.

   c. If any field test sample fails, the Installer shall follow failed weld procedures outlined in this section.

D. Laboratory seam testing performed by the CQA Laboratory.

   1. The Installer shall provide samples to the CQA Monitor as described elsewhere in these Special Provisions.

   2. The CQA Monitor shall send samples to the CQA Laboratory for "seam strength" and "peel adhesion" (ASTM D 6392) tests.

   3. Minimum acceptable values to be obtained for these tests are specified in Section 100-2.03.2.

   4. The CQA Laboratory shall:

      a. Test five specimens for each test method. Four of five specimens must meet minimum requirements. All peel specimens must peel less than 25 percent, or the entire sample will be considered as failing.

      b. Select specimens alternately by test from the samples (i.e., peel, shear, peel, shear, etc.).

      c. Provide verbal test results no more than one working day after receiving samples.

      d. Provide written test results within one week after receiving samples.

      e. Test both sides of the sample in peel for double wedge welded samples.

E. The Contractor shall not cover any seams which have not been tested.

F. The Installer shall keep a seaming log with the date, time, location, seaming technician, apparatus, temperature, and pass or fail criteria for each seam.

G. Acceptable Welded Seams:

   1. Acceptable welded seams shall be bracketed by two locations from which samples have passed destructive tests.

   2. For reconstructed seams exceeding 100 feet in length, a sample taken from within the reconstructed weld must pass destructive testing and the reconstructed seam must be approved by the CQA Monitor to be deemed acceptable.

   3. The CQA Monitor may require additional testing for seams that were welded by the same welder or welding apparatus, or which were welded during the same shift as a weld which failed testing.

H. Seams That Cannot Be Non-Destructively Tested – for seams that cannot be non-destructively tested, the Installer shall:

   1. Test the weld non-destructively prior to final installation if it is accessible to testing equipment. Seaming and testing in these areas shall be observed by the CQA Monitor.

2. Cap strip the weld if it cannot be tested prior to final installation. The welding and cap-stripping operations must be observed by the CQA Monitor and Installer for uniformity and completeness.

I. Failed Weld Procedures - when a destructive test failure is determined by the CQA Laboratory or by field tensiometer, the Installer shall follow one of the following two options:

1. First Option: reconstruct the seam between any two passing test locations.

2. Second Option:

a. Trace the weld at least 10 feet minimum in both directions from the location of the failed test, or to the end of the weld.

b. Obtain a small sample at both locations.

c. Give samples to the CQA Monitor for testing using a field tensiometer.

d. If these additional test samples pass field tests, then take laboratory samples.

e. If the laboratory samples pass, then reconstruct the weld or cap between the two test sample locations that bracket the failed test location. The final pass or fail criteria for a seam will be based on the results from the third party laboratory.

f. If any sample fails, then repeat the process to establish the zone in which the weld must be reconstructed.

100-2.03.7 REPAIRS

The Installer shall perform repair or replacement of Geomembrane in accordance with these Special Provisions.

A. For areas that have large defects, folds, or large wrinkles, the Installer shall remove and replace the material. The CQA Monitor shall determine areas that require removal.

B. Prior to covering, the Installer shall repair areas where bridging or trampolining of the Geomembrane occurs.

C. Repair, removal, and replacement is at Contractor's expense if the damage results from the Manufacturer’s, Contractor's, or the Contractor's subcontractor activities.

D. The Installer shall repair any portion of the Geomembrane exhibiting a flaw, leak, or failing a destructive or non-destructive test. Agreement upon the appropriate repair method will be determined between the Engineer, the CQA Consultant and the Installer. The Installer shall not commence welding on liner until a trial weld test sample, made by that equipment and operator, passes trial test. Repair procedures shall conform with the following requirements:

1. Patching shall be used to repair all destructive sample holes, tears, large holes (1/4-inch diameter or larger), tears with lengths of 2 inches or more, areas with blisters or undispersed raw materials, and areas contaminated by foreign matter.

2. Abrading and re-welding shall be used to repair small sections of seams.

3. Spot welding or seaming shall be used to repair small tears (less than 2 inches long), pin holes or other minor, localized flaws. The Installer may repair holes smaller than 1/4 inch by using an extrusion weld. The surface oxidation surrounding the hole shall be removed a minimum of one inch around the hole and then immediately welded. After the hole has been welded, it shall be vacuum tested for leaks. The result of the test, the name of the tester, and the date shall be recorded on the liner near the repair.

4. Capping shall be used to repair large lengths of failed seams.

5. Long lengths of defective seams shall be repaired by removing the seam and replacing with a strip of new material as directed by the CQA Monitor.

E. Additionally, repairs shall be performed in accordance with the following requirements:

1. The Installer shall abrade Geomembrane surfaces to be repaired via the use of extrusion welds no more than one (1) hour prior to the repair.
2. The Installer shall clean and dry all surfaces at the time of repair.
3. The Installer shall not commence with a repair until the repair procedures, materials, and techniques have been accepted by the CQA Monitor and the Engineer for the specific repair in question.
4. Patches shall be round or oval in shape, extend at least six inches beyond the defect, and be made of the same material as the Geomembrane. The edge of the patch shall be beveled and welded to the liner in accordance with the procedures outlined for extrusion welding. All patches shall be vacuum tested and the results recorded on the liner.
5. Unless otherwise instructed by the Engineer, the Installer shall cut Geomembrane below large caps to avoid water or gas collection between the sheets.

F. Verification of repair – the Installer shall:

1. Number and log each patch repair.
2. Non-destructively test each repair using methods specified in these Special Provisions.
3. Perform additional destructive tests at the discretion of the CQA Monitor.
4. Reconstruct repairs until tests indicate passing results.

100-2.03.8 ACCEPTANCE OF THE GEOMEMBRANE

A. The Contractor shall be responsible for maintaining the Geomembrane and shall retain ownership thereof until final acceptance by the Engineer.

B. The Engineer will accept Geomembrane installation when:

1. All required documentation from the Manufacturer, Fabricator, and Installer has been received and accepted.
2. The installation is finished.
3. Test reports verifying completion of all field seams and repairs, including associated testing, have been received and approved.
4. Written certification documents and drawings have been received by the Owner from the CQA Consultant.
5. The Engineer has approved the Contractor's as-built drawings required by Section 100-2.01.4.
6. The Operations Layer has been installed, the Geoelectric Leak Location Consultant has completed the geoelectric leak location survey, and any damage, holes or defects have been repaired by the Installer and repairs have been approved by the CQA Monitor.

100-2.04 MEASUREMENT AND PAYMENT

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

100-3 GEOCOMPOSITE

100-3.01 GENERAL

The Geocomposite is to be installed as a drainage media over the Geomembrane to ensure leachate is

transmitted to the leachate collection and removal system. The Geocomposite described in this Section will be a geonet with non-woven geotextile heat bonded on one side prior to delivery to the site.

100-3.01.1 SUMMARY

A. Section includes furnishing and installing Geocomposite.

B. Related Sections:

1. Section 19-4 – Landfill Earthwork
2. Section 100-1 - Geosynthetic Clay Liner
3. Section 100-2 - High Density Polyethylene Geomembrane
4. Section 100-4 – Geotextile
5. Section 100-5 - Operations Layer
6. Section 100-6 - Protective Plywood Cover
7. Section 101 – High Density Polyethylene Pipe

100-3.01.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D 792 – Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
2. ASTM D 1603 – Standard Test Method for Carbon Black in Olefin Plastics.
3. ASTM D 4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
4. ASTM D 4533 – Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
5. ASTM D 4716 – Standard Test Method for Constant Head Hydraulic Transmissivity of Geotextiles and Geotextile Related Products.
6. ASTM D 4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile.
7. ASTM D 4833 – Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
8. ASTM D 4873 – Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
9. ASTM D 5035 – Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Strip Method).
10. ASTM D 5199 – Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes.
11. ASTM D 5261 – Standard Test Method for Measuring Mass per Unit Area of Geotextiles.

B. Construction Quality Assurance (CQA) Plan For Phase III - Modules 9 & 10 Excavation and Liner System Construction, American Avenue Disposal Site.

100-3.01.3 DEFINITIONS

A. Construction Quality Assurance (CQA) Consultant: The party, independent from County or Contractor, that is responsible for observing and documenting activities related to the quality of material manufacturing, material installation, and other construction activities related to the project. Also responsible for issuing a CQA report sealed by a Professional Engineer registered in the State of California

B. Construction Quality Assurance (CQA) Laboratory: A laboratory selected by the CQA Consultant, independent from the Owner, Manufacturer, Fabricator, and Installer, responsible for conducting laboratory tests on samples of geosynthetics obtained at the site. Also referred to as the Geosynthetics Laboratory.

C. Construction Quality Assurance (CQA) Officer: A civil engineer, registered in the State of California as required by 27 CCR 20324(b)(2), who is responsible for implementing the CQA Plan, observing, verifying, and documenting the construction and for preparing, signing, and certifying the Construction Completion Report. Also referred to as the CQA Engineer. Construction Quality Assurance (CQA) Monitor: Site representative of the CQA Engineer responsible for documenting field observations and tests.

D. Engineer: Director of the Department of Public Works and Planning of Fresno County, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

E. Fabricator: The party responsible for the fabrication of Geocomposite panels constructed from rolls received from the manufacturer.

F. Geonet: A geosynthetic consisting of integrally connected parallel sets of ribs overlying similar sets at various angles.

G. Geocomposite: Two or more geosynthetics materials bonded together. Typically, one or two geotextile fabrics bonded to a geonet core for drainage purposes.

H. Geocomposite Manufacturer (Manufacturer): The party responsible for the production and quality of the Geocomposite.

I. Installer: The Installer is responsible for proper installation of the geosynthetic components in accordance with the Drawings and Specifications. The Installer may be affiliated with the Manufacturer.

J. Geoelectric Leak Location Contractor: A firm with specific expertise in performing electric leak location surveys on exposed or covered geomembrane

K. Owner: County of Fresno

L. Panel: The unit area of Geocomposite, a roll or a portion of a roll, that will be seamed or overlapped in the field.

100-3.01.4 SUBMITTALS

A. Qualifications (Manufacturer): The Contractor shall submit information necessary to evaluate the Manufacturer's qualifications in accordance with Section 100-3.01.5 of these Special Provisions at least 21 calendar days prior to ordering the material. Material shall not be ordered by the Contractor until the Manufacturer's qualifications have been reviewed and approved in writing by the Engineer.

B. Qualifications (Installer): The Contractor shall submit information necessary to evaluate the Installer's qualifications in accordance with Section 100-3.01.5 of these Special Provisions at least 21 calendar days prior to installation of the material. The submittal shall include the name of Installer and the names and resumes of the installation supervisor/field design engineer.

C. The Contractor shall furnish the following engineering data to the Engineer no less than 14 calendar days prior to shipping:

1. An instruction manual which includes the proper storage, handling, deployment, and joining of the Geocomposite.
2. Quality control certificates on the Geocomposite. The quality control certificates shall include the production date and the laboratory results from the supplier demonstrating compliance with the Geocomposite specifications described in Section 100-3.02.5.
3. Quality control certificates on the Geonet component of the geocomposite. The quality control certificates shall include the production date and the laboratory results from the geonet supplier demonstrating compliance with the geonet specifications described in Section 100-3.02.3.
4. Quality control certificates on the geotextile component of the geocomposite. The quality control certificates shall include the production date and the laboratory results from the geotextile supplier demonstrating compliance with the geotextile specifications described in Section 100-3.02.4.
5. Samples and a complete description of the Geocomposite proposed for use. The Geocomposite shall meet or exceed requirements of this section.
6. Written instructions for storage and handling of the Geocomposite material prior to shipment to the site.
7. Roll length and width.
8. Sample warranties for review.

D. The Contractor shall submit the following upon completion of the installation:

1. A certification stating that the Geocomposite has been installed in accordance with the Plans and Special Provisions.
2. The Manufacturer's product warranty.
3. The Contractor’s installation warranty.

100-3.01.5 QUALIFICATIONS

A. The manufacturer of the Geocomposite shall manufacture the material in the United States or in Canada and shall have previously demonstrated the ability to produce this Geocomposite by having successfully manufactured a minimum of ten million square feet of similar Geocomposite material for landfill installations. A list of similar projects completed in which the manufactured material has been successfully used shall be submitted.

B. The Installer of the Geocomposite shall have previously demonstrated the ability to install this Geocomposite by having successfully installed a minimum of five million square feet of similar Geocomposite material for landfill installations. A list of projects completed by the Installer in which similar product has been successfully installed shall be submitted.

100-3.01.6 QUALITY ASSURANCE

A. The Owner will engage and pay for the services of a CQA Consultant, and a CQA Laboratory for monitoring the quality and installation of Geocomposite material being installed unless otherwise specified.

B. The Contractor shall render assistance as necessary for CQA Monitor to collect product samples in accordance with the CQA Plan.

C. Geocomposite shall not be shipped to the site until conformance testing has been completed and the test results are determined to comply with the Specifications. If Geocomposite is shipped before conformance testing has been completed and the test results are determined to comply with the Specifications, it will be at the Contractor's risk and the Contractor assumes all responsibility for the handling of geocomposite that is determined to not comply with the Specifications.

D. Conformance test results will be reviewed consistent with ASTM D 4759. If a test result is in non-conformance with the Specifications, all material from that production lot represented by the failed conformance test shall be rejected. Rejected material may be minimized by bounding the non-conforming material with additional passing tests conducted by the CQA laboratory. Additional tests and replaced material will be provided at no additional cost to the Owner.

100-3.01.7 DELIVERY, STORAGE, AND HANDLING

The Contractor shall be responsible for transporting, unloading, and storing the Geocomposite. The Contractor shall:

A. Protect material from ultraviolet light exposure, precipitation, inundation, mud, dirt, dust, puncture, cutting, and other damaging or deleterious conditions.

B. Follow the Manufacturer's written instruction for shipping, storage, and handling unless otherwise approved in writing by the Engineer.

C. Ship the Geocomposite such that it is not damaged in transport.

D. Unload Geocomposite in the presence of the CQA Monitor.

E. Notify the Engineer in writing 48 hours in advance of delivery of the Geocomposite. Material deliveries will not be allowed on-site unless and until submittals pertaining thereto which are required prior to delivery have been reviewed and accepted and advance written notice of delivery has been provided to the Engineer in accordance with these Special Provisions.

F. Stack Geocomposite rolls on a prepared surface. The surface shall be prepared such that the net is not subjected to rocks or sharp objects, water, oil, or other deleterious conditions.

G. Immediately restore damaged protective covering.

H. Facilitate the CQA Monitor's inspection of material during the off-loading process so that damaged material may be documented by the CQA Monitor.

I. Separate damaged rolls from undamaged rolls and store at locations designated by the Engineer until proper disposition of material is determined by Engineer.

J. Replace any Geocomposite determined by the Engineer to be unacceptable.

100-3.01.8 WARRANTY

A. The Contractor shall provide a Manufacturer's Warranty for Geocomposite material in compliance with the requirements of these Special Provisions. The Manufacturer's Warranty shall:

1. Provide a minimum 20-year warranty for the material against deterioration due to exposure to buried elements.

2. Cover the costs of material replacement and installation; assuming the area is in a clean, dry, unencumbered condition. In the event the area cannot be rendered as such, compensation for defective material will be provided to the Owner on a pro rata basis for the estimated cost to the Owner at that time of supplying and installing material to a clean, dry, and unencumbered condition by a third-party installer.

B. The Contractor shall provide an installation warranty for Geocomposite material in compliance with the requirements of these Special Provisions. The installation warranty shall provide a minimum of 2 year non-prorated warranty for the installation against defects.

100-3.02 PRODUCTS

100-3.02.1 MANUFACTURERS

Material shall be provided by a Manufacturer meeting the qualification requirements in Section 100-3.01.5 or by a distributor approved by a qualified Manufacturer.

100-3.02.2 MATERIAL

The Geocomposite supplied for use as drainage material shall be comprised of non-woven, needle-punched, or continuous or staple filament, polyester or polypropylene geotextile, heat bonded to one side of an integrally formed, solid rib, extruded, HDPE Geonet core.

100-3.02.3 GEONET CORE

The Geonet core (prior to being heat bonded to the geotextile) shall conform to the requirements in Table 100-3A.

Table 100-3A
Properties for Geonet

Test	Method	Requirement
Thickness	ASTM D 5199	Minimum 250 mil
Density	ASTM D 1505	0.94 g/cm^3 min. avg.
Carbon Black Content	ASTM D 4218	2.0 % - 3.0 %
Tensile Strength	ASTM D 7179	Minimum 55 lb/in
Transmissivity[1]	ASTM D 4716	Minimum 14.5 gal/min/ft

1. Transmissivity measured at a load of 10,000 psf and a gradient of 0.1 sandwiched between steel plates with a seating time of 15 min.

100-3.02.4 GEOTEXTILE (COMPONENT TO GEOCOMPOSITE)

The Geotextile component (prior to being heat bonded to the Geonet core shall conform to the following minimum average roll values (MARV) as defined by the Federal Highway Administration for the following requirements listed in Table 100-3B.

Table 100-3B
Properties for Geotextile

Test	Method	Requirement
Mass per Unit Area	ASTM D 5261	8 oz/yd^2
Grab Tensile Strength[1] and Elongation[2]	ASTM D 4632	Minimum 225 lbs and <50%
CBR Puncture Resistance	ASTM D 6241	Minimum 600 lbs
Trapezoidal Tear	ASTM D 4533	Minimum 90 lbs
Water Flow	ASTM D 4491	Minimum 100 gal/min/ft^2
Apparent Opening Size	ASTM D 4751	No. 80 Sieve

1. Measured in weakest direction.
2. Measured in lower elongation direction.

100-3.02.5 GEOCOMPOSITE

The Geocomposite shall:

A. Be produced in the United States or Canada. Material from other sources may be used only with prior written approval by the Engineer.

B. Be marked with Manufacturer's name, product designation, lot number, and roll number.

C. Meet the Geocomposite/Geomembrane interface shear strength requirements specified in Tables 100-2C.

D. No delamination (separation between the geonet and geotextile) greater than 6 square feet area within a 6-foot radius of any point shall be allowed.

E. Geonet shall be heat bonded to one layer of geotextile.

F. Unlaminated edge: 12" MAX allowable.

G. Meet the requirements in Table 100-3C.

Table 100-3C
Properties for Geocomposite

Test	Method	Requirement
Hydraulic Transmissivity(1)	ASTM D 4716	7.5 gal/min/ft
Ply Adhesion	ASTM D 7005	1.0 lbs/in
Interface Shear Strength	See Table 100-2C	
1. Geocomposite measured at a load of 10,000 psf and a gradient of 0.1 sandwiched between steel plates with a seating time of 15 minutes.		

100-3.02.6 MANUFACTURER SOURCE QUALITY CONTROL

A. The Manufacturer shall perform quality control tests shown in Table 100-3D at the manufacturing plant at the frequency shown.

Table 100-3D
Quality Control Tests

Test	Test Designation	Frequency (see notes)
Geonet Core		
Thickness	ASTM D 5199	A
Density	ASTM 1505	B
Carbon Black Content	ASTM D 4218 or D 4218	B
Transmissivity	ASTM D 4716	C
Tensile Strength	ASTM D 6364	B
Geotextile		
Mass per Unit Area	ASTM D 5261	B
Grab Tensile Strength and Elongation	ASTM D 4632	B
Water Flow	ASTM D 4491	C
Apparent Opening Size	ASTM D 4751	C
Geocomposite		
Hydraulic Transmissivity	ASTM D 4716	D
Ply Adhesion	ASTM D 7005	A

A. One per 50,000 square feet produced.
B. One per 100,000 square feet produced.
C. One per 500,000 square feet produced.
D. One per 540,000 square feet produced.

B. The Contractor shall provide the CQA Monitor with quality control certificates from the Manufacturer for each lot and each shift's production of Geocomposite. The quality control certificates shall include:
   1. Roll numbers and identification.
   2. Sampling procedures.
   3. Results of quality control tests, including a description of test methods used.

100-3.02.7 LABELING

The Manufacturer shall mark or tag Geocomposite rolls with the following:

A. Manufacturer's name.

B. Product identification.

C. Lot number.

D. Roll number.

E. Roll dimensions.

100-3.02.8 EQUIPMENT

Equipment shall:

A. Be adequately maintained in order to avoid delaying work.

B. Be supplied by a power source capable of providing constant voltage under a combined-line load.

C. Be provided with a protective lining and splash pad large enough to catch spilled fuel under electric generator, if used on geosynthetics.

100-3.03 EXECUTION

100-3.03.1 DEPLOYMENT

The Installer shall:

A. Not commence with installation of the Geocomposite until the first phase of geoelectric leak location survey has been performed and the Installer has repaired any damage, holes, or defects in accordance with Section 100-2 of these Special Provisions.

B. Install product in accordance with the Manufacturer's recommendations.

C. Place Geocomposite over the Geomembrane only after approval by the Engineer.

D. Installer shall be responsible for staging the Work so that no construction equipment needs to be driven over already deployed geomembrane panels while deploying subsequent geocomposite or subsequent Operations Soil Layer.

Equipment used for placing soils shall not be driven directly over geosynthetics. A minimum thickness of 1 ft (300 mm) of material is required between a low ground pressure (LGP) dozer and underlying geosynthetics. A minimum thickness of 3 ft of material is required between rubber-tired vehicles and underlying geosynthetics. In areas of heavy vehicle traffic, such as access ramps, the material thickness should be at least 3 ft. In any case, the following table shall be complied with during construction:

E.

Maximum Allowable Equipment Ground Pressure (psi)	Initial Lift Thickness Over Geosynthetics (feet)
5	1.0
10	1.5
15	2.0
>20	>3.0

F. Follow Manufacturer's recommendations, standards, and guidelines unless otherwise stated in these Special Provisions or directed by the Engineer.

G. Deploy with the exposed geonet side of the geocomposite in contact with the geomembrane.

H. Secure Geocomposite during deployment by placing sandbags as ballast.

I. Fill sandbags with the same material as that which is used for the Operations Layer.

J. Maintain ballast in place until the Geocomposite is covered.

K. Maintain the Geocomposite until it has been approved and covered.

L. Use appropriate equipment to transport the Geocomposite from the storage area and deploy it on top of the Geomembrane liner. This equipment shall not damage the underlying Geomembrane or GCL.

M. Repair or replace any damaged material as directed by the Engineer.

K. Ensure that dust, stones, moisture, or other deleterious materials are not trapped in the Geocomposite or in underlying geosynthetics.

L. Clean the surface of the Geomembrane of dirt and loose materials prior to placement of the Geocomposite.

M. Examine Geocomposite over its entire surface to ensure that no potentially harmful foreign objects such as needles, are present and remove foreign objects if encountered.

N. Cover Geocomposite within 72 hours unless otherwise approved in writing by the Engineer.

O. Ensure that workers do not smoke or vape or engage in other activities that could damage the Geocomposite or underlying Geomembrane.

P. Maintain the Geomembrane free from holes or damage during installation of the Geocomposite.

Q. Repair any holes or damaged areas in the Geomembrane in accordance with Section 100-2.09, “Repairs” of these Special Provisions.

R.

100-3.03.2 SEAMS AND OVERLAPS

The Installer shall:

A. Connections (Geonet) shall be overlapped a minimum of 6-inches along the length and one foot along the width.

B. Connections (Geonet) shall be made using white or yellow nylon cable ties secured at three-foot intervals along the length and 1-foot centers along the width.

C. Do not use metallic devices for tying.

100-3.03.3 FIELD QUALITY ASSURANCE

A. General

1. The Manufacturer, Fabricator, and Installer shall participate in and conform with all terms and requirements of the Owner's quality assurance program. The Contractor is responsible for this participation.

2. The Installer shall designate a technician that is responsible for supervising and/or conducting the Installer's field quality control program.

B. Conformance Testing (Performed by CQA Laboratory).

1. The CQA Monitor shall obtain conformance testing samples of the Geocomposite delivered to the site and forward the samples to the CQA Laboratory.

2. The Installer shall allow 5 working days for conformance testing following the date material is available to the CQA Consultant.

3. The CQA Monitor shall have the following tests performed by the CQA Laboratory at a frequency of one per batch or one per 100,000 square feet of material supplied, whichever results in greatest number of tests, to determine Geocomposite conformance with the requirements of these Special Provisions.

   a. Transmissivity: ASTM D 4716.

   b. Ply Adhesion: ASTM D7005

4. Where optional procedures are noted in the test method, the requirements of these Special Provisions shall prevail.

5. Additional tests may be performed at the discretion of the CQA Monitor.

6. The Contractor shall provide equipment and personnel to assist the CQA Monitor in obtaining samples in accordance with the following:

   a. The Installer shall sample across the entire width of the roll as directed by the CQA Monitor.

   b. Samples shall not be taken from the first 2 feet of a roll.

   c. The Installer shall cut samples 3 feet long by width of roll as directed by the CQA Monitor.

d. The CQA Monitor shall mark the roll number, machine direction, and the date on which the sample was taken on each sample.

e. Samples shall be taken at a rate of one per batch or one per 100,000 square feet of material supplied, whichever results in the greatest number of samples.

100-3.03.4 REPAIR – The Installer shall repair Geocomposite in accordance with the following:

A. Any holes or tears in the Geocomposite shall be repaired by placing a patch extending 2 feet beyond the edges of the hole or tear. The patch shall be secured by installing approved tying devices through the Geocomposite every 6 inches in a grid pattern across the entire surface of the patch.

B. Any method of underpatching shall require approval from the Engineer. If the hole or tear width across the roll is more than 50 percent of the width of the roll, the damaged area will be cut out and the two portions of the Geocomposite will be joined in accordance with Section 100-3.03.2 above.

100-3.03.5 PROTECTION

When placing soil materials over the Geocomposite the Contractor shall:

A. Ensure that there is no damage to Geocomposite.

B. Ensure that there is no slippage of Geocomposite over underlying layers.

C. Ensure that no excessive tensile stresses are applied to the Geocomposite.

100-3.03.6 ACCEPTANCE OF THE GEOCOMPOSITE

A. The Contractor shall be responsible for maintaining the Geocomposite and shall retain ownership thereof until final acceptance by the Engineer.

B. The Engineer will accept Geocomposite installation when:

1. All required documentation from the Manufacturer, Fabricator, and Installer has been received and accepted.

2. The installation is finished.

3. Written certification documents and drawings have been received by the Owner from the CQA Consultant.

5. The Operations Layer has been installed, the Leak Location Contractor has completed the geoelectric leak location survey, and any damage, holes, or defects have been repaired by the Installer and repairs have been approved by the CQA Monitor.

100-3.04 MEASUREMENT AND PAYMENT

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

100-4 GEOTEXTILE

100-4.01 GENERAL

The Geotextile to be furnished and installed under this contract shall conform to the requirements outlined herein along with the accompanying geosynthetics quality assurance plan.

The Contractor shall notify the Engineer 14 calendar days in advance of starting the Geotextile installation.

100-4.01.1 SUMMARY

A. Section includes furnishing and installing Geotextile around the leachate pipe collection trenches.

B. Related Sections:

1. Section 19-4 - Landfill Earthwork
2. Section 100-1 - Geosynthetic Clay Liner
3. Section 100-2 - High Density Polyethylene Geomembrane
4. Section 100-3 - Geocomposite
5. Section 100-5 - Operations Layer
6. Section 100-6 - Protective Plywood Cover
7. Section 101 – High Density Polyethylene Pipe

100-4.01.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D 3786 – Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics – Diaphragm Bursting Strength Tester Method
2. ASTM D 4491 — Test Methods for Water Permeability of Geotextiles by Permittivity.
3. ASTM D 4533 — Test Method for Trapezoid Tearing Strength of Geotextiles.
4. ASTM D 4632/ D4632M — Test Method for Grab Breaking Load and Elongation of Geotextiles.
5. ASTM D 4751 — Test Method for Determining Apparent Opening Size of a Geotextile.
6. ASTM D 5261 — Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
7. ASTM D 6241 – Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile Related Product Using a 50-mm Probe

B. Construction Quality Assurance (CQA) Plan for Phase III - Modules 9 & 10 Excavation and Liner System Construction, American Avenue Disposal Site on.

100-4.01.3 DEFINITIONS

A. Construction Quality Assurance (CQA) Consultant: The party, independent from County or Contractor, that is responsible for observing and documenting activities related to the quality of material manufacturing, material installation, and other construction activities related to the project. Also responsible for issuing a CQA report sealed by a Professional Engineer registered in the State of California. Construction Quality Assurance (CQA) Laboratory: A laboratory selected by the CQA Consultant independent from the Engineer, Contractor, Manufacturer, Fabricator and Installer, responsible for conducting laboratory tests on samples of materials obtained at the site. Also referred to as the Geosynthetics Laboratory.

B. Construction Quality Assurance (CQA) Officer: A civil engineer, registered in the State of California as required by 27 CCR 20324(b)(2), who is responsible for implementing the CQA Plan, observing, verifying, and documenting the construction and for preparing, signing, and certifying the Construction Completion Report. Also referred to as the CQA Engineer. Also, referred to as the CQA Engineer.

C. Construction Quality Assurance (CQA) Monitor: Site representative of the CQA Engineer responsible for documenting field observations and tests.

D. Engineer: Director of the Department of Public Works and Planning of Fresno County, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

E. Geotextile: A permeable geosynthetic comprised solely of textiles.

F. Geosynthetic Installer (Installer): The Installer is responsible for proper installation of the geosynthetic components in accordance with the Drawings and Specifications. The Installer may be affiliated with the Manufacturer Also called the Installer.

G. Geoelectric Leak Location Consultant: A firm with specific expertise in performing electric leak location surveys on exposed or covered geomembrane

H. Manufacturer: The party responsible for the production and quality of the Geotextile.

K. Owner: County of Fresno

L. Panel: The unit area of Geotextile, a roll or a portion of a roll, that will be seamed or overlapped in the field.

100-4.01-4 SUBMITTALS

A. Qualifications (Manufacturer): The Contractor shall submit information necessary to evaluate the Manufacturer's qualifications in accordance with Section 100-4.01.5 of these Special Provisions at least 21 calendar days prior to ordering the material. Material shall not be ordered by the Contractor until the Manufacturer's qualifications have been reviewed and approved in writing by the Engineer.

B. Qualifications (Installer): The Contractor shall submit information necessary to evaluate the Installer's qualifications in accordance with Section 100-4.01.5 of these Special Provisions at least 21 calendar days prior to installation of the material. The submittal shall include the name of Installer and the names and resumes of the installation supervisor/field design engineer.

C. The Contractor shall submit the following 14 calendar days prior to Geotextile shipment to the site:

1. Samples and complete description of Geotextile fabric proposed for use, that meet or exceed requirements of these Special Provisions.
2. Manufacturer's certificates of compliance with specified product requirements prior to shipment. This submittal shall include Manufacturer's Quality Control (MQC) testing.
3. An instruction manual which includes the proper storage, handling, deployment, and sewing of the Geotextile. This manual shall be in compliance with these Special Provisions, the quality assurance plan, and any conditions of warranty.
4. Quality control certificates on the Geotextile. The data submitted with the Geotextile shall include the production date and the laboratory results from the supplier demonstrating compliance with the specifications described in Section 100-4.04, Material of these Special Provisions.
5. Roll length and width.
6. Specifications and manufacturer's certification on the thread used to sew the Geotextile. The thread shall be a polymeric material with chemical resistance and strength characteristics that are equal to or exceed those of the Geotextile.
7. Sample warranties for review.

D. The Contractor shall submit the following upon completion of the installation:

1. A certification stating that the Geotextile has been installed in accordance with the Plans and Special Provisions.
2. The Manufacturer's product warranty.
3. The Contractor's installation warranty.

100-4.01.5 QUALIFICATIONS

A. The manufacturer of the Geotextile shall manufacture the material in the United States or in Canada and shall have previously demonstrated the ability to produce this Geotextile by having successfully manufactured a minimum of ten million square feet of similar Geotextile material for landfill installations. A list of similar projects completed in which the manufactured material has been successfully used shall be submitted.

B. The Installer of the Geotextile shall have previously demonstrated the ability to install this Geotextile by having successfully installed a minimum of five million square feet of similar Geotextile material for landfill installations. A list of projects completed by the Installer in which similar product has been successfully installed shall be submitted.

100-4.01.6 QUALITY ASSURANCE

A. The Owner will engage and pay for the services of a Construction Quality Assurance (CQA) Consultant, and a Construction Quality Assurance (CQA) Laboratory for monitoring the quality and installation of the Geotextile material being installed unless otherwise specified.

B. The Contractor shall aid the CQA Monitor in product sampling by providing personnel and equipment necessary to move, cut, and protect Geotextile rolls.

100-4.01.7 DELIVERY, STORAGE, AND HANDLING

The Contractor shall:

A. Protect Geotextile from ultraviolet light exposure, precipitation, inundation, mud, dirt, dust, puncture, cutting, and other damaging or deleterious conditions.

B. Follow the Manufacturer's written instructions for shipping, storage, and handling unless otherwise approved in writing by the Engineer.

C. Ship Geotextile in closed trailers.

D. Separate damaged rolls from undamaged rolls and store at locations designated by the Engineer until proper disposition of material is determined by Engineer.

E. Ship Geotextile such that it is not damaged in transport.

F. Unload Geotextile in the presence of the CQA Monitor.

G. Notify the Engineer in writing 48 hours in advance of delivery. Material deliveries will not be allowed on-site unless and until submittals pertaining thereto which are required prior to delivery have been reviewed and accepted and advance written notice of delivery has been provided to the Engineer in accordance with these Special Provisions.

H. Facilitate the CQA Monitor's inspection of material during the off-loading process so that damaged material may be documented by the CQA Monitor.

I. Separate damaged rolls from undamaged material.

J. Defer to the Engineer's direction regarding the final disposition of damaged rolls.

K. Replace any Geotextile determined to be unacceptable at no cost to Owner.

L. Stack Geotextile rolls on a prepared surface. The surface shall be prepared such that the material is not subjected to rocks or sharp objects, water, oil, or other deleterious conditions.

M. Ship and store the Geotextile rolls in opaque and water tight protective covers.

N. Use appropriate equipment to transport the Geotextile from the storage area and deploy it without driving over placed geosynthetics.

O. Installer shall be responsible for staging the Work so that no construction equipment needs to be driven over already deployed geosynthetics while deploying subsequent geotextile or subsequent Operations Soil Layer.

P. Equipment used for placing soils shall not be driven directly over geosynthetics. A minimum thickness of 1 ft (300 mm) of material is required between a low ground pressure (LGP) dozer and underlying geosynthetics. A minimum thickness of 3 ft of material is required between rubber-tired vehicles and underlying geosynthetics. In areas of heavy vehicle traffic, such as access ramps, the material thickness should be at least 3 ft. In any case, the following table shall be complied with during construction:

Maximum Allowable Equipment Ground Pressure (psi)	Initial Lift Thickness Over Geosynthetics (feet)
5	1.0
10	1.5
15	2.0
>20	>3.0

Q. Repair any damage caused to the Geocomposite or underlying liners to the satisfaction of the CQA Monitor at no cost to the Owner.

R. Follow delivery, storage, and handling procedures outlined in ASTM D 4873.

100-4.01.8 WARRANTY

A. The Contractor shall provide a Manufacturer's Warranty for Geotextile material in compliance with the requirements of these Special Provisions. The Manufacturer's Warranty shall:

1. Provide a minimum 20-year warranty for the material against deterioration due to exposure to buried elements.

2. Cover the costs of material replacement and installation; assuming the area is in a clean, dry, unencumbered condition. In the event the area cannot be rendered as such, compensation for defective material will be provided to the Owner on a pro rata basis for the estimated cost to the Owner at that time of supplying and installing material to a clean, dry, and unencumbered condition by a third-party Installer.

B. The Contractor shall provide an installation warranty for Geotextile material in compliance with the requirements of these Special Provisions. The installation warranty shall provide a minimum of 2 year non-prorated warranty for the installation against defects.

100-4.02 PRODUCTS

100-4.02.1 MANUFACTURERS

Material shall be provided by a Manufacturer meeting the qualification requirements in Section 100-4.01.5 or by a distributor approved by a qualified Manufacturer.

100-4.02.2 GEOTEXTILE

Geotextile shall conform to the following requirements:

A. Shall be produced in the United States or Canada. Material from other sources may be used only with prior written approval by the Engineer.

B. Geotextile shall be comprised of non-woven, continuous-filament needle-punched polypropylene or polyester fabric which is oriented into a stable network that maintains its structure during handling, placement, and long-term service.

C. If polypropylene is used in Geotextile, it shall be UV stabilized.

D. Geotextile shall not be heat burnished except as a finishing process.

E. Geotextile shall be resistant to soil chemicals.

F. Geotextile shall be new product made from virgin materials.

G. Geotextile shall be furnished in rolls wrapped in impermeable, opaque coverings.

H. Geotextile rolls shall be marked with Manufacturer's name, product designation, lot number, and roll number.

I. Geotextile shall meet the requirements in the following table:

Table 100-4A

Properties for Geotextile

Test	Test Designation	Unit	Requirement
Mass per Unit Area	ASTM D 5261	oz/yd^2	9.5 min. avg.
Grab Tensile Strength (1)	ASTM D 4632	lbs	250 min. avg.
Grab Tensile Elongation (2)	ASTM D 4632	%	50 min. avg.
CBR Puncture Strength	ASTM D 6241	lbs	700 min. avg.
Trapezoidal Tear	ASTM D 4533	lbs	100 min. avg.
Permittivity	ASTM D 4491	sec^{-1}	1.0 min. avg.
Apparent Opening Size	ASTM D 4751	US sieve	100 max. avg.

1. Measured in weakest direction.
2. Measured in direction of lower elongation.

100-4.02.3 MANUFACTURER SOURCE QUALITY CONTROL

The Geotextile Manufacturer shall:

A. Perform the following quality control tests of Geotextile at the manufacturing plant:

Table 100-4B

Testing Frequency

Test	Test Designation	Unit	Frequency
Mass per Unit Area	ASTM D 5261	oz/yd^2	A
Grab Tensile Strength	ASTM D 4632	lbs	B
Grab Tensile Elongation	ASTM D 4632	%	B
CBR Puncture Strength	ASTM D 6241	lbs	B
Trapezoidal Tear	ASTM D 4533	lbs	B
Permittivity	ASTM D 4491	sec^{-1}	C
Apparent Opening Size	ASTM D 4751	US sieve	B

A. Two tests per roll.

B. One test per 100,000 square feet or one per lot, whichever results in the greater number of tests.

C. Provide certification and test results. Test results may be for geotextile type, in lieu of actual product shipped.

B. Reject rolls for which quality control requirements are not met.

C. Provide the CQA Monitor quality control certificates for each lot and each shift's production. The quality control certificates shall include:

1. Roll numbers and identification
2. Sampling procedures
3. Results of quality control tests, including a description of test methods used.

100-4.02.4 LABELING

The Geotextile Manufacturer shall:

A. Mark or tag Geotextile rolls with the following information:

1. Manufacturer's name
2. Product identification
3. Lot number
4. Roll number
5. Roll dimensions

B. Mark special handling requirements on rolls.

100-4.02.5 EQUIPMENT

The Contractor’s equipment shall:

A. Be adequately maintained and be sufficient in numbers in order to avoid delaying work.

B. Be supplied by a power source capable of providing constant voltage under a combined-line load.

C. Be provided with a protective lining and splash pad large enough to catch spilled fuel under an electric generator, if used, on geosynthetics.

100-4.03 EXECUTION

100-4.03.1 EXAMINATION

Prior to installation of Geotextile, the Contractor, Installer, and the CQA Monitor shall:

A. Examine the underlying construction for conformance with the Special Provisions.

B. Verify that the underlying installations are complete and have been installed as designed.

C. Ensure that as-built information has been obtained.

100-4.03.2 DEPLOYMENT

The Installer shall:

A. Follow Manufacturer's recommendations, standards, and guidelines unless otherwise stated in these Special Provisions or directed by the Engineer.

B. Place Geotextile only after underlying material installation has been approved by the Engineer.

C. Cut Geotextile using approved cutter only.

D. Protect other in-place geosynthetic materials when cutting Geotextile.

E. Repair or replace, at the Engineer’s discretion, landfill components damaged during Geotextile installation at no cost to Owner.

F. Secure Geotextile during deployment by placing sandbags as ballast.

G. Fill sandbags with the same material as that which is used for the Operations Layer.

H. Maintain ballast in place until the Geotextile is covered.

I. Maintain the Geotextile until it has been approved and covered.

J. Ensure that dust, stones, moisture, or other deleterious materials are not trapped in the Geotextile or in underlying geosynthetics.

K. Examine Geotextile over entire completed surface to ensure that no potentially harmful foreign objects, such as needles, are present. Remove any foreign objects.

L. Either seam, or overlap a minimum of two feet in lieu of seaming, Geotextile used as cushion or wrap around gravel fill.

M. Cover Geotextile within 72 hours unless otherwise approved by the Engineer.

N. Ensure that workers do not smoke, vape or engage in other activities that could damage the Geotextile, Geocomposite or underlying Geomembrane.

O. Maintain the Geomembrane and the Geocomposite free from holes or damage during installation of the Geotextile. Any holes or damaged areas shall be repaired in accordance with these Special Provisions.

100-4.03.3 SEAMS AND OVERLAPS

Except where otherwise specified, the Geotextile is to be seamed by sewing. Other seaming methods, such as hot wedge seaming, may be used with prior approval of the Engineer if the minimum strength requirement can be obtained.

Seams in Geotextile placed in trenches may be formed by overlapping a minimum of 2 feet instead of sewing. Seaming is not required for Geotextile wrapped around gravel fill, or placed under pipes if the minimum 2-foot overlap is maintained.

The Installer shall:

A. Not seam horizontally on slopes greater than 10 horizontal to 1 vertical (i.e., seam up and down, not across slopes).

B. Seam Geotextile by sewing unless alternative method is approved by the Engineer.

C. Overlap Geotextile 6 inches prior to sewing or other seaming.

D. Ensure that no soil materials are present within the seams.

E. Sew using polymeric thread with chemical resistance properties equal to or exceeding those of the Geotextile unless alternative method is approved by the Engineer.

F. Seam Geotextile by sewing with 401 two-thread chain stitch unless alternative method is approved by the Engineer.

G. Ensure that seams have a strength equal to at least 50 percent of the Geotextile strength as measured in a wide-strip tensile test.

100-4.03.4 FIELD QUALITY ASSURANCE

A. General

1. The Manufacturer, Fabricator, and Installer shall participate in and conform with all terms and requirements of the Owner's quality assurance program. The Installer is responsible for this participation.

2. The Installer shall designate a technician that is responsible for supervising and/or conducting the Installer's field quality control program.

B. Conformance Testing (Performed by CQA Laboratory).

1. The CQA Monitor shall obtain conformance testing samples of the Geotextile delivered to the site and forward the samples to the CQA Laboratory.

2. The Installer shall allow 5 working days for conformance testing following the date material is available to the CQA Consultant.

3. The CQA Monitor shall have the following tests performed by the CQA Laboratory at a frequency of one per batch or one per 100,000 square feet of material supplied, whichever results in greatest number of tests, to determine Geotextile conformance with the requirements of these Special Provisions:

   a. Mass per Unit Area: ASTM D 5261.

   b. Grab Tensile Strength: ASTM D 4632.

   c. CBR Puncture Strength: ASTM D 6241.

   d. Apparent Opening Size: ASTM D 4751.

   e. Permittivity: ASTM D 4491.

   f. Trapezoidal Tear: ASTM D4533

4. Where optional procedures are noted in the test method, the requirements of these Special Provisions shall prevail.

5. Additional tests may be performed at the discretion of the CQA Monitor.

6. The Contractor shall provide equipment and personnel to assist the CQA Monitor in obtaining samples in accordance with the following:

   a. The Installer shall sample across the entire width of the roll as directed by the CQA Monitor.

   b. Samples shall not be taken from the first 3 feet of a roll.

c. The Installer shall cut samples 3 feet long by width of roll as directed by the CQA Monitor.

d. The CQA Monitor shall mark the roll number, machine direction, and the date on which the sample was taken on each sample.

e. Samples shall be taken at a rate of one per batch or one per 150,000 square feet of material supplied, whichever results in the greatest number of samples.

100-4.03.5 REPAIR PROCEDURES

A. The Installer shall repair holes or tears in Geotextile as follows:

1. On 10 horizontal to 1 vertical (10:1) or steeper slopes: Patch from the same Geotextile material and continuously sew in place.

2. On slopes flatter than 10:1: Patch from the same Geotextile material, sew in place with a minimum overlap of 24 inches in all directions.

3. Remove all sheets with tears exceeding 10 percent of the roll width and replace with new material.

4. On the side slopes holes or tears shall be repaired with fabric patches sewn into place no closer than 1 inch from any edge.

B. The Contractor shall remove soil and other material, which may have penetrated through the torn Geotextile before repairing.

100-4.03.6 PROTECTION

When placing soil materials over Geotextile, the Contractor shall ensure that:

A. The Geotextile is not damaged.

B. The Geotextile does not slip over underlying layers.

C. The placement of soil does not induce excessive tensile stresses in Geotextile.

100-4.03.7 ACCEPTANCE

A. The Contractor shall retain ownership and responsibility for Geotextile until acceptance by the Owner.

B. The Owner will accept the Geotextile installation when:

1. The installation is finished.

2. All required documentation from the Manufacturer and Installer has been received and approved.

3. Verification of the adequacy of all field seams and repair, including associated testing, is complete.

4. Written certification documents have been received by the Owner from the CQA Consultant.

5. The Operations Layer has been installed, the Leak Location Contractor has completed the geoelectric leak location survey, and any damage, holes, or defects have been repaired by the Installer and repairs have been approved by the CQA Monitor.

100-4.04 MEASUREMENT AND PAYMENT

100-4.04.1 MEASUREMENT

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

100-5 OPERATIONS LAYER

100-5.01 GENERAL - The Operations Layer shall consist of selected native materials that shall be placed over the Geotextile in accordance with methods prescribed by the liner system Installer, these Special Provisions and as directed by the Engineer.

100-5.01.1 SUMMARY

A. Section includes placement of on-site soils as Operations Layer.

B. Related Sections:

1. Section 19-4 – Landfill Earthwork
2. Section 100-1 - Geosynthetic Clay Liner
3. Section 100-2 - High Density Polyethylene Geomembrane
4. Section 100-3 - Geocomposite
5. Section 100-6 - Protective Plywood Cover
6. Section 101– High Density Polyethylene Pipe

100-5.01.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D 422 – Standard Test Method for Particle-Size Analysis of Soils

2. ASTM D 1140 – Standard Test Method for Amount of Material in Soil Finer than the No. 200 (75 mm) Sieve.

3. ASTM D 2487 – Standard Test Method for Classification of Soils for Engineering Purposes.

4. ASTM D 2488 – Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).

5. ASTM D 7002 – Standard Practice for Electric Leak Location on Exposed Geomembrane Using the Water Puddle Method.

6. ASTM D 7007 – Standard Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earthen Materials.

7. ASTM D 7909 – Standard Guide for Placement of Blind Actual Holes during Electrical Leak Location Surveys of Geomembranes.

100-5.01.3 DEFINITIONS

A. Construction Quality Assurance (CQA) Consultant: The monitoring firm responsible for implementation of the CQA activities.

B. Construction Quality Assurance (CQA) Laboratory: A laboratory selected by the CQA Consultant independent from the Engineer, Contractor, Manufacturer, Fabricator and Installer, responsible for conducting laboratory tests on samples of materials obtained at the site. Also referred to as the Geosynthetics Laboratory.

C. Construction Quality Assurance (CQA) Officer: The professional representative of the CQA Consultant responsible for implementation of the CQA plan. Also, referred to as the CQA Engineer.

D. Construction Quality Assurance (CQA) Monitor: Site representative of the CQA Consultant responsible for documenting field observations and tests.

E. Engineer: Director of the Department of Public Works and Planning of Fresno County, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

F. Leak Location Contractor: A firm specializing in leak location testing of synthetic liner materials, independent from the Engineer, Manufacturer, Fabricator, and Installer, responsible for performing the geoelectric leak location survey of the installed Geomembrane.

G. Operations Layer: Soil placed over the liner system to protect the liner system and to provide a working surface for the placement of waste.

H. Owner: County of Fresno

100-5.02 MATERIAL - Selected material, as identified by the Engineer, from the excavation of Modules 9 & 10, shall be used to construct the Operations Layer. The material shall be free of rocks, roots, or any other material or objects that could damage the underlying synthetic liner materials. The maximum particle size shall be ¾-inch when in contact with geosynthetic materials, unless otherwise approved by the Engineer.

During construction the CQA Consultant shall conduct Sieve Analysis (D6913) and Classification (ASTM D 2487/2488) tests at a frequency of one test per 10,000 cubic yards.

100-5.03 PLACEMENT - The methods to be used in placing the Operations Layer shall be approved in writing by the liner material Installer and the Engineer before placement of the Operations Layer may begin. The Contractor shall submit a written plan for the Operations Layer placement for approval at least 10 calendar days in advance of the Contractor's proposed starting date.

All synthetic liner materials underlying the Operations Layer shall be inspected and approved by the Engineer prior to placing the Operations Layer.

The Operations Layer shall be placed in a manner that will not damage or displace the synthetic liner materials. Wrinkles in the liner material shall not be allowed to develop to a height that will fold over when the Operations Layer is placed.

The Operations Layer shall be placed in layers with a minimum thickness of one foot unless otherwise allowed by the Engineer.

The Operations Layer shall be compacted by track walking with a minimum of one pass with a D-7 or approved equivalent dozer.

The surface of the Operations Layer shall be graded and rolled to provide a smooth uniform surface and shall not vary more than 0.1 foot from the grade established by the Engineer at any point.

100-5.05 MEASUREMENT AND PAYMENT

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

100-6 PROTECTIVE PLYWOOD COVER

100-6.01 GENERAL - The protective plywood cover provides protection to the perimeter of the geosynthetic liner system for future construction activities.

100-6.02 MATERIALS - The protective plywood cover shall consist of 4 ft. x 8 ft. x 1/2 inch CDX plywood. Mill rejected material is allowed.

100-6.03 PLACEMENT - The Contractor shall place protective plywood cover over the geosynthetic liner continually along the extent of the north, west and south edges of Modules 9 and 10 as shown on the Plans. The Contractor shall overlap ends of plywood sheets a minimum of three (3) inches.

100-6.04 MEASUREMENT AND PAYMENT –

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

100-7 GEOELECTRIC LEAK LOCATION SURVEY SUPPORT

100-7.01 GENERAL

Requirements for support and assistance by Contractor to the Geoelectric Leak Location Survey Consultant (Leak Location Consultant) for performance of an electronically based liner leak survey (leak location survey) for post-construction liner monitoring on the primary HDPE geomembrane prior to placement of geocomposite and operations layer (Water Puddle Method), and after placement of the operations layer (Dipole Method) in Modules 9 and 10.

The Leak Location Consultant will be contracted directly by the CQA Engineer.

REFERENCES

A. ASTM International, latest revisions.

1. ASTM D7002-22 Standard Practice for Electrical Leak Location on Exposed Geomembranes Using the Water Puddle Method.

2. ASTM D7007-16 Standard Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earthen Materials.

3. ASTM D7909-21a Standard Guide for Placement of Intentional Leaks During Electrical Leak Location Surveys of Geomembranes

INFORMATION AVAILABLE

A. The CQA Officer shall provide the Leak Location Consultant with Drawings showing:

1. All layers constituting the lining system.

2. Details of all liner penetrations.

3. Peripheral details, including welds between primary and secondary liners at slope/floor transitions, tie-in welds to adjacent lining systems and temporary terminations.

4. Structures and obstructions above the liner.

5. Electrical equipment above the liner, if any.

100-7.02 PRODUCTS

GROUND WIRE

A. Ground wire shall be continuous 12 or 14 awg uninsulated solid copper wire.

B. Wire shall be new condition.

C. Supplied by Contractor to fit geometry provided by the Leak Location Consultant.

100-7.03 EXECUTION

SITE PREPARATION AND SUPPORT – WATER PUDDLE SURVEY

A. The Contractor shall provide the Engineer and CQA Officer with an updated project schedule for scheduling of the leak location survey a minimum of three (3) weeks prior to the preferred survey date. Contractor shall allow two (2) weeks for mobilization and completion of each survey. The CQA Officer shall be responsible for coordinating the survey based on the Contractor's schedule.

B. The Contractor is responsible for preparing the survey area and providing support to the leak location consultant for the leak location surveys. The preparation consists of, but is not limited to, the following:

1. Provide the CQA Officer the liner installation schedule to allow coordination with the Leak Location Consultant.

2. Provide and install permanent ground wires in contact with the compacted backfill and permeable material located under the primary geomembrane within the encapsulated leachate collection pipes and riser pipes. The ground wires must be continuous and coordinated with the Leak Location Consultant to be in contact with all encapsulated soil material.

3. Provide a water truck and driver with water as a continuous water source for the water puddle leak location testing. Water source shall have a standard garden hose bib capable of providing water pressure of 30 PSI.

4. Provide one laborer per leak location equipment operator to assist with the water puddle leak location testing (two labors minimum).

5. Remove and dispose of residual water, as needed.

6. Render the geomembrane clean and uncluttered. Remove all standing water from the surface of the geomembrane and provide electrical isolation around the full perimeter of the survey area.

7. The survey area must have a low point where water is allowed to collect. As the survey progresses, water is sprayed onto the liner. If the water exits the survey area and touches the surrounding ground, the survey cannot be performed. Often features such as rain flaps and berms are required to keep the water restrained to the survey area. The Contractor must be prepared to install rain flaps and berms as necessary and coordinated with the Leak Location Contractor.

8. The subgrade must contain sufficient moisture to conduct the survey. One percent by weight is usually adequate. It may be necessary to wet the subgrade if it has desiccated before deployment of the GCL and geomembrane. The Contractor may also wet the installed geomembrane with approximately 0.1 inches of water (2,700 gallons per acre) several days before the performance of the leak location survey. An equivalent recent rainfall would also suffice.

9. Calibration requires drilling holes in the geomembrane. The Contractor must be prepared to have these holes repaired. All hole locations shall be surveyed as they are created.

10. If it is determined the survey must take place at night due to excessive wrinkles in the liner during the day, light plants supplied by the Contractor must be provided onsite at the time and for the duration of the water puddle survey.

SITE PREPARATION AND SUPPORT – DIPOLE SURVEY

A. The Contractor shall provide the Engineer and CQA Officer with an updated project schedule for scheduling of the leak location survey a minimum of three (3) weeks prior to the preferred survey date. Contractor shall allow one (1) week for mobilization and completion of each survey. The CQA Officer shall be responsible for coordinating the survey based on the Contractor's schedule.

B. Contractor is responsible for preparing the survey area and providing support to the leak location consultant for the leak location surveys. The preparation consists of, but is not limited to, the following:

1. Coordinate with the CQA Officer to provide a survey area within the liner expansion area that is electrically isolated from the surrounding ground (i.e. the cover soil is not in contact with the existing operations layer or ground surface outside of the lined Modules 9 and 10 area). Isolation can be accomplished by open trenching or installation of a continuous non-conductive insulator such as a geomembrane flap welded to the primary. Coordinate with the Leak Location Contractor for instruction and installation (by Contractor).

2. Provide water, water truck, and driver, to maintain the survey area prior to and during the dipole survey to ensure that there is adequate moisture in the material(s) covering the geomembrane for the dipole leak location testing. To detect a leak, moisture must exist in the leak and be in contact with moisture in the materials above and below the liner. Therefore, the material(s) covering the geomembrane must be frequently moistened with water prior to conducting the leak location survey. In order to achieve uniform moisture distribution, the Contractor shall add water as the construction progresses on and within the sump gravel and soil operations layer. A water truck must be available at all times as it may be necessary to wet the surface well in advance of the survey, as deemed necessary by the CQA Officer on behalf of the leak location consultant.

3. The calibration process requires digging a hole down to the surface of the geomembrane to place the artificial leaks at a location selected by the leak location consultant. The Contractor is to provide a backhoe and/or hand labor, as

appropriate, to excavate the operations layer and gravel drainage layer down to the geomembrane. Locations of artificial leaks shall be surveyed. The Contractor shall be responsible for initial excavation and backfill at the calibration hole, then uncovering and retrieving the artificial leak apparatus, and again backfilling the hole appropriately, including patching any geotextiles above and below the soil or gravel layer.

4. Several calibration exercises may be required, and the Contractor must be prepared to assist with each survey calibration. In some cases, an actual hole may be drilled in the geomembrane for calibration, in which case the Contractor must be prepared to repair the calibration hole. All calibration locations shall be surveyed.

5. If the leak location survey identifies any leaks or suspect locations, then the Contractor shall uncover, expose, repair any leaks detected, allow for non-destructive testing, repair geotextiles, replace gravel layer and replace operations layer in accordance with the Specifications.

100-7.04 LEAKS REPAIRS

The Leak Location Consultant shall mark the locations of all identified or indicated leaks with flags, sand bags, and/or marking paint. Once uncovered by the contractor the identified leaks shall be marked with marking paint. The Contractor shall provide surveying of the identified leak locations. Contractor shall identify all leak locations on the as-built HDPE geomembrane panel layout drawing with coordinates and then provide to the Engineer and CQA Engineer.

101 - HIGH DENSITY POLYETHYLENE PIPE

101-1.01 GENERAL

The Contractor shall furnish all labor, tools, materials, equipment and incidentals for installing the perforated and plain wall High Density Polyethylene (HDPE) pipe of various sizes as shown on the plans and as specified in these Special Provisions.

101-1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D 638 – Standard Test Method for Tensile Properties of Plastics.
2. ASTM D 790 – Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
3. ASTM D 1238 – Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
4. ASTM D 1505 – Standard Test Method for Density of Plastics by the Density-Gradient Technique.
5. ASTM D 1603 – Standard Test Method for Carbon Black in Olefin Plastics.
6. ASTM D 1693 – Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.
7. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
8. ASTM D 3035 – Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
9. ASTM D 3350 – Specification for Polyethylene Plastic Pipe and Fittings Materials.

10. ASTM F 714 – Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

101-1.03 DELIVERY STORAGE AND HANDLING OF THE HDPE PIPE

The Contractor shall be responsible for loading, transporting, unloading and storing the HDPE pipe. Care shall be taken to prevent damage by abrasion and/or puncturing.

Once the HDPE pipe has been unloaded, it shall be stacked on a prepared surface no more than eight layers high. The surface shall be prepared such that the pipe is not subjected to rocks or sharp objects, water, oil, or other deleterious conditions.

The Contractor shall use appropriate equipment to transport the pipe from the storage area to its point of placement in the Modules. The Contractor shall repair or replace any damaged pipe to the satisfaction of the Engineer.

101-1.04 MATERIALS

The HDPE pipe and fittings shall be manufactured from new, first quality high density polyethylene resin that is UV stabilized with carbon black and shall meet the following specifications:

PROPERTY	TEST METHOD	UNIT	REQUIRED VALUES
Density	ASTM D-1505	gm/cm^3	0.955 gm/cm^3 min.
Melt Index	ASTM D-1238	gm/10 min	0.15 gm/min max. avg.
Flexural Modulus	ASTM D-790	psi	120,000 psi min. avg.
Tensile Strength	ASTM D-638	psi	3,000 psi min. avg.
Environmental Stress Crack	ASTM D-1693 Test Condition C	Failure %, hrs	5,000 hours failure min. avg.
Carbon Black	ASTM D-1603		2% to 3%

The Contractor shall provide manufacturer's certification for all pipe which lists the property tested, the test method, and the results of the manufacturer's testing. Any type of pipe for which a manufacturer's certification is not provided and any pipe not meeting the requirements of these Special Provisions shall be rejected by the Engineer and replaced by the Contractor at the Contractor's expense.

The pipe shall be homogeneous throughout, uniform in color, and free of cracks, holes (except where specified) foreign materials, blisters or deleterious faults.

Pipe shall be marked at 10-foot intervals or less with a coded number which identifies the manufacturer, SDI size, material, machine, date an shift on which the pipe was extruded.

Polyethylene resin shall meet or exceed the requirements of ASTM D 3350 for PE 4710 material with a Cell Classification of 445464C, or better.

Pipe shall be SDR 13.5 and shall conform to ASTM D 3035 and ASTM F 714.

Pipe perforations shall be slots arranged in three (3) rows evenly spaced around the circumference of the pipe. The slots shall have a maximum width of 0.125 inches. The slots shall be uniformly spaced along the length of the pipe and shall provide a minimum inlet area of 2.5 inches per foot of pipe. **The exterior and interior of the pipes shall be free of burrs and cuttings from the slots.**

Fittings and couplings shall be marked with the manufacturer's name or logo, size and material from which they were molded.

All fittings and couplings shall be manufactured using the same resin and additives and shall be from the same manufacturer as the pipe.

Caps shall be Slip on conforming to the requirements for HDPE fittings.

101-1.05 STAINLESS STEEL PULL ROPE

The stainless steel pull ropes to be placed in the leachate collection pipe shall be 1/4-inch diameter P.V.C. coated stainless steel pull rope with a minimum tensile strength of 1,000 lbs. Nylon pull ropes shall have a minimum tensile strength of 400 lbs. The Contractor shall submit a sample of the nylon pull rope to the Engineer. Nylon pull rope shall not be installed until the submitted sample has been approved by the Engineer.

101-1.06 INSTALLATION

The HDPE pipe shall be installed to the lines and grades as shown on the plans, specified in these Special Provisions and as directed by the Engineer.

Follow the manufacturer's recommendations when hauling, unloading, and stringing the pipe. Do not push or pull pipe and fittings over sharp projections or abrasive surfaces, drop, or have objects dropped on it. Inspect for defects before installation. Any piping showing kinks, buckles, cuts, gouges, or any other damage which in the opinion of the Engineer will affect performance of the pipe must be removed from the site. Replace material found to be defective before or after laying with sound material without additional expense to the Owner.

Permeable material conforming with the requirements elsewhere in these Special Provisions and as shown on the plans shall be provided under the pipe.

Perforated pipe shall be placed with 2 rows of perforations at the top. All loose material shall be removed from within the pipe. The pipe shall be laid in a manner that does not damage pipe or underlying geosynthetics.

Pipe connections on solid HDPE pipes shall be permanently joined by fusion welding or a mechanical joining system approved by the Engineer. Electro-fusion fittings will be allowed.

HDPE pipe shall be wrapped with fiberglass or other suitable material to prevent bonding and allow for thermal expansion wherever Portland cement concrete is poured around HDPE pipe.

The Contractor shall use the nylon pull rope to install 870 LF of stainless steel rope from cleanout and inspection riser (to be constructed by the Contractor) at north side of Module 9 (N13871.47, E12995.55) , through leachate collection pipe in Module 9, and shall terminate at the top of the cleanout and inspection riser pipe located along the west edge of Module 10 at N13240.62, E12777.74. The stainless steel pull rope shall be securely anchored in the end caps at the top of the riser pipes.

The Contractor shall use the nylon pull rope to install 870 LF of stainless steel rope from cleanout and inspection riser (to be constructed by the Contractor) at the west side of Module 9 (N13340.97, E112777.72) through leachate collection pipe in Module 10, and shall terminate at southern boundary of Module 10 (N12711.57, E12996.20). The stainless steel pull rope shall be securely anchored in the end caps. The excess stainless steel pull rope shall be coiled and stored at the top of the cleanout and inspection riser located at N13340.97.

The Contractor shall install the nylon pull rope with a length of 870 LF in the cleanout and inspection riser pipe (to be constructed by the Contractor) which terminates along the west edge of Module 10 at N12761.82. Upon completion, the nylon pull rope shall extend through the Module 10 the cleanout and inspection riser pipe, and shall terminate at southern boundary of Module 10 (N12711.57, E12996.20). The nylon pull rope shall be securely anchored in the end caps at the ends of the riser pipes. Excess nylon pull rope shall be coiled and stored at the top of the cleanout and inspection riser located at N12761.82.

The Contractor shall furnish closed circuit television equipment for an interior inspection of the newly installed cleanout and inspection 6-inch HDPE and perforated HDPE pipes. The Contractor shall perform television inspection of the pipes after complete installation of the pipes and placement of the permeable material.

If the video inspection indicates that any pipes are damaged or improperly installed, as determined by the Engineer, the Contractor shall repair or replace damaged pipe as directed by the Engineer. Repair or replacement of damaged or improperly installed pipes shall be performed by the Contractor at the Contractor's expense and no additional compensation will be allowed therefor.

In the event that any pipes require repair or replacement, the Contractor shall re-perform the video inspection on all pipes that have been repaired or replaced. Re-inspection of pipes which have been repaired or replaced shall be performed by the Contractor at the Contractor's expense and no additional compensation will be allowed therefor.

The Contractor shall provide the County two DVD's and an external thumb drive showing the distance (footage) from the cleanouts.

101-1.06 MEASUREMENT AND PAYMENT

Refer to 9-1.01A BID ITEM EXPLANATION for measurement and payment

102 – MECHANICAL SYSTEMS

102-1.01 GENERAL

The Contractor shall furnish all labor, tools, materials, equipment and incidentals for installing the mechanical systems including the fittings, pumps, valves for the leachate collection and pan lysimeter sumps as shown on the plans and as specified in these Special Provisions.

102-1.02 SUBMITTALS

Shop Drawings: Shop Drawings shall contain layout drawings including dimensions, details, pipe joints, fittings, specials, valves, appurtenances, anchors, guides, and material lists. Fabrication drawings shall indicate spool pieces, spacers, adapters, connectors, fittings, and supports to accommodate equipment and valves in a complete and functional system.

102-2.02 MATERIALS

102-2.02.1 SUMP PUMPS

The leachate collection and pan lysimeter sumps pumps shall be submersible pumps and motor, EPG Companies, Inc. Sure Pump™ Model WSDPT 3-5 . Each pump shall include 300 feet of lead. The level sensor associated with each pump shall be EPG Part Number is LT05X300P.

In coordination with pump manufacturer, there is a minimum 12 weeks lead time for this product. Contractor shall schedule the work accordingly to have pumps delivered on time to finish project within the allocated time per Section 8 of these Special provisions.

102-2.02.2 FLOW METER

The leachate collection and pan lysimeter flow meters shall be in-line magnetic flow meter transmitter, Endress and Hauser Promag P 300, 5P3B25, DN25 1".

102-2.02.3 JACKETED TUBING

A. Both the individual tubes and the jacket shall be nylon 12. The tubing shall have excellent resistance to landfill leachate.

B. The jacketed nylon tubing shall be a continuous sheath for ease of installation without hang-ups of kinks.
C. Jacketed tubing shall be able to house the discharge, exhaust and air supply lines.

102-2.02.4 NUTS, BOLTS AND WASHERS

Bolts, nuts and washers for all applications shall be 316 stainless steel conforming to the requirements of ASTM A593.

102-2.02.5 VALVES

Valve materials shall be suitable for the intended application. Materials not specified shall be high-grade standard commercial quality, free from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended.

102-3.0 INSTALLATION

A. The system shall be installed strictly in conformance with the manufacturer's instructions and recommendations in configuration shown on the Plans.
B. Prior to acceptance, an operational test of the electrically operated landfill leachate automatic pumping system shall be performed to determine if the installed equipment meets the purpose and intent of the Specifications. Tests shall demonstrate that the equipment is not mechanically, structurally, or otherwise defective; is in safe and satisfactory operating condition; and conforms to the specified operating characteristics. Tests shall include checks for excessive vibration, leaks in all piping and seals, correct operations of control systems and equipment, proper alignment, excessive noise levels, and power consumption.
C. If any deficiencies are revealed during any test, such deficiencies shall be corrected and test re-conducted.

Project Details

Contract Number 23-24-SW

Construction Quality Assurance Plan Phase III - Modules 9 & 10 Excavation and Liner System Construction

American Avenue Disposal Site

Submitted to

County of Fresno
Department of Public Works and Planning
2220 Tulare St., 6th Floor
Fresno, California 93721

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December 2023

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Definitions

Wherever the terms listed below are used in this CQA, their intent and meaning shall be interpreted as defined in this section.

ASTM - ASTM International (formerly American Society for Testing and Materials), 100 Barr Harbor Drive, PO Box C700, West Conshohocken, Pennsylvania, 19428-2959; also, the numerical designation of a standard specification, test method, or practice established by ASTM International.

Caltrans - Caltrans (aka California Department of Transportation), 1120 N Street, P.O. Box 942873, Sacramento, California 94273-0001; also, the numerical designation of a standard specification, test method, or practice established by Caltrans.

Contract Documents - The official document set issued for the project, including bidding requirements, contract forms, contract conditions, Construction Drawings, Construction Specifications, addendums and contract modifications.

Contractor - A person or persons, firm, partnership, corporation, or combination, whether private, municipal, or public, who, as an independent contractor, has entered into a contract with County to perform the construction activities for the project. This includes but is not limited to the earthwork contractor(s), geosynthetic installer(s), or their subcontractor(s).

Construction Completion Report - Report to be prepared at the completion of construction by the CQA Engineer/Officer that documents the as-built conditions and record drawings as discussed further in this CQA Plan.

Construction Drawings - The official plans, profiles, cross-sections, elevations, notes, and details, as well as their amendments and supplemental drawings, showing the locations, character, dimensions, and details of liner construction and grading.

Construction Manager - The designated representative of the County, responsible for construction contract administration.

Construction Quality Assurance - A planned series of observations and tests to verify and document that quality control functions have been performed adequately and to assess compliance with contract drawings.

Construction Quality Assurance Consultant (CQA Consultant) - The party, independent from County or Contractor, that is responsible for observing and documenting activities related to the quality of material manufacturing, material installation, and other construction activities related to the project. Also responsible for issuing a CQA report sealed by a Professional Engineer registered in the State of California.

Construction Quality Assurance (CQA) Laboratory - A laboratory selected by the CQA Consultant independent from the Engineer, Contractor, Manufacturer, Fabricator and Installer, responsible for conducting laboratory tests on samples of materials obtained at the site.
Construction Specifications - The official quality requirements for products, materials, and workmanship upon which the design and construction of the project are based. Also referred to as Specifications.

CQA Officer - A civil engineer, registered in the State of California as required by 27 CCR 20324(b)(2), who is responsible for implementing the CQA Plan, , verifying, and documenting the construction and for preparing, signing, and certifying the Construction Completion Report. Also referred to as the CQA Engineer.

CQA Monitor - A designated site representative of the CQA Engineer responsible for observing and documenting field conditions and tests.

County – County of Fresno, Department of Public Works and Planning (County).

Daily Report - A record of construction progress prepared by the CQA monitor which documents construction on a daily basis as outlined in this CQA Plan.

Earthwork - Work performed by the Contractor using soil or soil-like materials, including (but not limited to) excavation, hauling, stockpiling, general fill and compacted earth fill.

Engineer - Director of the Department of Public Works and Planning of Fresno County, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

Excavation - The removal of soil, soil-like material, and rock from in-place masses within areas identified on the Construction Drawings for excavation.

Fabricator – Company or manufacturer responsible for joining or prefabricating in a factory or warehouse individual manufactured components together.

Geosynthetic Clay Liners (GCL) - is a relatively thin layer of processed clay (typically bentonite) fixed between two sheets of geotextile or bonded to a geomembrane.

Geomembrane - A polymeric sheet material that is impervious to liquid, also referred to as flexible membrane liner, membrane, or liner.

Geotextile - Woven or nonwoven sheet synthetic fabric manufactured for use as a cushion, separator, or reinforcement in geotechnical applications.

Geocomposite – Two or more geosynthetics materials bonded together. Typically, two geotextile fabrics bonded to a geonet core for drainage purposes.

Geoelectric Leak Location Consultant – Consultant with specific expertise in performing electric leak location surveys on exposed or covered geomembrane.

GSI - Geosynthetic Institute.

Installer – The Installer is responsible for proper installation of the geosynthetic components in accordance with the Drawings and Specifications. The Installer may be affiliated with the Manufacturer. Also called the Geosynthetic Installer.

Manufacturer - The Manufacturer(s) is responsible for production of the geosynthetic components outlined in this plan. The Manufacturer may be affiliated with the Installer. Each Manufacturer must pre-qualify that they are able to produce material that meets the requirements of the Project Specifications.

Nonconformance - A deficiency in characteristic, documentation, or procedure that renders the quality of an item or activity unacceptable or indeterminate, including (but not limited to) physical defects, test failures, failure to conform to the requirements of the Construction Drawings or Construction Specifications, or inadequate documentation.

Procedure - A document that specifies or describes how an activity is to be performed.

Project Document - Any document, either required or incidental, prepared to further the construction of the liner, including (but not limited to) Contractor submittals, Construction Drawings, Construction Specifications, Technical Specification, Record Drawings, shop drawings, construction quality control and quality assurance plans, safety plans, and project schedules.

Quality Assurance - A planned and systematic program of procedures and documents to show that items of work or service meet the requirements of the Construction Drawings and

Construction Specifications. Quality assurance does not include quality control, and will be performed by the CQA Engineer, acting through the CQA Monitor when appropriate.

Quality Control - Actions that provide a means of measuring and regulating the characteristics of items of work or service so that they comply with the requirements of the Construction Drawings and Construction Specifications. Quality control shall be performed by the Contractor, Subcontractors, manufacturers, and suppliers, as appropriate.

Record Drawings - Drawings recording the dimensions, details, coordinates, and characteristics of the project as they were actually constructed; informally referred to as "as-builts".

RWQCB – California Regional Water Quality Control Board, Central Valley Region.

Surveyor - The individual(s) or firm(s) responsible for locating project features, staking grades to establish required elevations, and measuring construction quantities as needed to carry out; and produce the data on which the record drawings. All such work being performed by or under the continuous supervision of a licensed land surveyor registered in the State of California.

Testing - Verification that an item meets specified requirements by subjecting that item to a set of physical, chemical, environmental, or operating conditions and recording the associated physical state or response of the item.

USCS - Unified Soil Classification System, as defined in ASTM D 2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) (if laboratory data are available) or ASTM D 2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (if laboratory data are unavailable).

1. Construction Quality Assurance

1.1 Introduction and Scope

This Construction Quality Assurance (CQA) Plan describes the CQA requirements for the Phase III - Modules 9 & 10 Excavation and Liner System Construction at the American Avenue Disposal Site (AADS) owned and operated by County of Fresno, Department of Public Works and Planning (County). CQA refers to the duties of a third party CQA Consultant hired by the County to monitor, inspect, and evaluate materials and workmanship during construction. The CQA activities document the compliance of the Contractor with the Construction Drawings (Drawings) and Construction Specifications (Specifications) for the construction which has been approved by the California Regional Water Quality Control Board (RWQCB).

The overall goal of this CQA Plan is to assure that proper construction techniques and procedures are used and that the project is built in accordance with the Drawings and Specifications. The intent is to identify and define issues that may occur during construction and to observe that these issues are corrected before construction is complete. A written final report prepared and certified by the CQA Consultant will be prepared summarizing the construction activities and observing that the installation was performed in general accordance with the Drawings and Specifications.

All quality assurance activities shall be conducted in accordance with this CQA Plan, and with the Drawings and Specifications. Where there is a discrepancy, the Specifications shall govern unless otherwise specified by the County and approved by the RWQCB. The CQA Monitor shall observe all field installation activities as described in this CQA Plan. The CQA Consultant shall be responsible for ensuring that the proper number of personnel are on-site and capable of observing construction activities as described in this document. The CQA Monitor shall be present during all phases of construction that require CQA observation. Documentation shall meet the requirements of this CQA Plan and the Specifications.

1.2 Duties of CQA Personnel

It is the duty and responsibility of the CQA Consultant to implement the elements of this CQA Plan in order to ensure that the construction and installation of the composite liner system is performed in accordance with the approved Drawings and Specifications, Title 27 of the California Code of Regulations, and 40 CFR 258 (Subtitle D). The CQA personnel shall make

every effort to communicate in an efficient and effective manner to the Contractor's representatives on issues concerning testing and observation procedures and results of materials or in situ tests performed.

The CQA Consultant is not in a position to direct construction activities, but is encouraged to give advice to the County to relay to the Contractor on items which may improve the quality or speed progress of the construction.

The CQA Consultant and its representatives shall make every effort to furnish test results to the Contractor in a prompt manner. The representatives of the CQA Consultant shall report to the County any nonconformance items, which cannot be resolved promptly.

The CQA Monitor will be on-site as required during the construction project to ensure that all aspects of construction are monitored and documented.

1.3 Personnel Qualifications

1.3.1 CQA Officer

The CQA Officer shall have formal academic training in civil engineering or a closely related discipline and will be a registered civil engineer or certified engineering geologist in the State of California. The CQA Officer shall have experience in earthworks construction, landfill design and construction, and geomembrane and leachate collection system installations. The CQA Officer shall have practical technical and managerial experience that will allow the CQA Plan to be properly implemented. The CQA Officer must be able to communicate effectively with the County personnel and the Contractor so that there will be a clear understanding of construction activities and the CQA Plan.

1.3.2 CQA Monitor

The CQA Monitors will work directly under the responsible charge of the CQA Officer. The CQA Monitors will have formal training and practical experience in inspecting and testing earthworks construction, geomembrane installations, and leachate collection system installations, including conducting and recording inspection activities, preparing daily reports, and performing field testing. In addition, knowledge shall be required of the specific field practices and construction techniques for landfill liner construction and all codes and regulations involving material handling, observation of testing procedures, equipment, and reporting procedures.

2. Meetings

2.1 General

Throughout the entire construction and installation of the liner system, close communication between all parties involved with the project is essential. In order to coordinate activities between the Engineer, CQA Consultant, and Contractor, as well as set up proper lines of authority and reporting, meetings shall be held before and during construction. The type and purpose of meetings to be held for this project are described in this section.

2.2 Preconstruction Meeting

A preconstruction meeting shall be held prior to project start-up. The parties that shall attend this meeting are the Engineer, Contractor, and CQA Officer, CQA Monitor, Geosynthetics Installer and others designated by the Engineer. The purpose of this meeting is to:

- Identify key personnel
- Review the Drawings, Specifications, and CQA Plan
- Review project tasks and responsibilities
- Review project schedule
- Review lines of communication and authority
- Review reporting and documenting procedures
- Review testing equipment and test methods
- Review protocol for submittal of CQA conformance testing data sheets
- Conduct a site inspection to review work areas, stockpile areas, access roads, and related project issues
- Review geomembrane seaming numbering system and welding procedures

The CQA Officer shall document the preconstruction meeting and copies shall be provided to all attendees and other parties requested by the Engineer. Preconstruction meeting documentation shall become part of the project documents.

2.3 Daily Progress Meetings

An informal progress meeting shall be held before the start of each construction shift. The daily progress meetings shall be attended by the CQA Monitor, Contractor, and Engineer. The purpose of this meeting shall be to:

- Review the proposed activities scheduled by the Contractor for the day
- Discuss any issues or deficiencies that have arisen during construction
- Review the results of any test data
- Discuss the Contractor's deployment of personnel and equipment
- Review the previous day's activities including the effectiveness of procedures taken to alleviate any deficiencies

All progress meetings shall be documented by the CQA Monitor on his daily field construction inspection report.

2.4 Weekly Progress Meetings

Progress meetings will be held to review the previous week's activities or progress, discuss present and future work, and discuss any current or potential construction issues. The CQA Officer, CQA Monitor, Engineer, Contractor, and all active subcontractors shall attend. All weekly progress meetings will be documented by the CQA Monitor or CQA Officer who will transmit minutes by the end of the second working day to all parties.

2.5 Work Deficiency Meetings

As needed, meetings shall be held to discuss specific issues or deficiencies that occur during construction that cannot be easily resolved. Work deficiency meetings shall be attended by the CQA Monitor, CQA Officer, Engineer, and Contractor. The purpose of these meetings is to:

- Identify the nature and extent of the issue
- Discuss the means necessary to correct the deficiency or issue
- Provide a solution to the issue and determine how the corrective action shall be implemented

All work deficiency meetings will be documented by the CQA Consultant or Engineer who will transmit minutes to all attending parties. Deficiency meeting documentation shall become part of the project documents.

3. Design Changes

3.1 Minor Design Changes

Minor changes to the Drawings and Specifications may be necessary to maintain or enhance quality during the project or to adjust for unforeseen field conditions. Minor changes must be approved by the Engineer.

Procedures for providing minor changes include the following:

- The need for a design change may become apparent during the course of construction of the project and a request for a change may be initiated by any individual associated with the project.
- All proposed design changes must be approved by the Engineer and submitted to the CQA Officer with necessary documentation supporting the change for approval. All design changes must meet the intended quality and technical requirements of the design.
- Approved changes will be distributed to the Engineer, CQA Monitor, CQA Officer, Contractor, Geosynthetics Installer, applicable subcontractor(s), and the RWQCB as required.
- Minor changes do not include changes that decrease the environmental protection of the unit such as decreasing the number or thickness of liners, decreasing the number of sumps, changing the synthetic liner materials, etc.

3.2 Major Design Changes

Major changes to the Drawings and Specifications are unlikely to occur but may become necessary during the course of construction. Major changes may include elimination of landfill design components and drainage features and addition or changes to liner components and the extent of liner installation. Major design changes will only be initiated by the County (with

concurrence by the CQA Consultant). The following procedures will be implemented for all major changes:

- A special meeting will be scheduled immediately with the RWQCB and LEA as necessary to discuss the need for the change.
- The Engineer and CQA Officer will both attend the meeting to present the basis for the change. Requested changes and supporting documentation will be provided at the meeting.
- Major changes will not be implemented without the express written approval from pertinent regulatory agencies (e.g. RWQCB and/or LEA).
- Copies of approved changes will be distributed to Engineer, CQA Monitor, CQA Officer, Contractor, applicable subcontractor(s), and pertinent states and local regulatory agencies.

4. Earthwork

4.1 General

This section outlines the requirements for earthwork operations for the construction of the landfill liner system. The Contractor shall excavate soils and prepare the module subgrade as necessary to achieve the grades set forth within the Drawings and Specifications. Earthwork includes but is not limited to:

- Excavation to/from stockpiles areas
- Module subgrade preparation
- Engineered/Structural Fill Placement
- Class I dry permeable material placement
- Excavation of the existing liner termination
- Operations layer placement

Specifically excluded from this section are the geomembrane installation, GCL installation, geotextile installation, and geocomposite installation, which are addressed within later sections of this CQA Plan.

The CQA Monitor shall observe that the Contractor has conducted all surveying and as-built drawing preparation as required by the Specifications. Where called for in this CQA plan or in the Specifications, the following test methods may apply:

Standard	Title and Test Description
ASTM C117	Standard Test Method for Materials Finer than the # 200 Sieve in Mineral Aggregates by Washing
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D1140	Standard Test Methods for Determining the Amount of Material Finer than the # 200 Sieve in Soils by Washing
ASTM D1556	Density and unit weight of soil in place by the sand-cone method
ASTM D1557	Laboratory compaction characteristics of soils using Modified Effort ("Modified Proctor" method)
ASTM D2216	Laboratory determination of water (moisture) content of soil and rock
ASTM D2434	Permeability of granular soils (constant head)
ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D2488	Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)
ASTM D2937	Standard Test Method for Density of Soil by the Drive Cylinder Method
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils
ASTM D4318	Liquid limits, plastic limit, and plasticity index of soils (Atterberg limits)
ASTM D4643	Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Heating
ASTM D6938	In-Place Density and Water Content of Soil and Soil Aggregate by Nuclear Methods
ASTM D6913	Particle Size Distribution (Gradation) of Soil using Sieve Analysis

4.2 Soil Sampling

4.2.1 Sample Processing

The CQA Monitor is responsible for the timely processing and testing of soil samples. The CQA Officer must determine which samples will be tested on-site and which will be tested off-site. This determination will be made based on available manpower, available equipment, complexity of test, and time available to determine results. For expediency, samples tested off-site should be shipped within 24 hours of when they are obtained.

As test data is obtained from the on-site and off-site laboratories it must be summarized in the form it will appear in the CQA report.

4.2.2 Sample Numbering and Logging

The CQA Monitor must maintain a sample numbering system for all soil samples obtained for the project in a master log. These samples include those obtained prior to construction for conformance or slope stability testing, and samples obtained during construction such as samples obtained for moisture-density relationship testing.

Documentation of soil sampling must be summarized in the form it will appear in the CQA report, and be maintained throughout the project. The log must include soil sample numbers, each labeled with a unique identification number, beginning with (0001) and proceeding sequentially. No sample number can be repeated, and re-tests of a sample that does not meet specified requirements must be given the original number with a letter suffix (i.e., re-tests for a sample 0021 not meeting specified requirements would be 0021A, 0021B, etc.). Information contained in the master soil sample log must include:

- Sample number
- Test(s) being performed
- Date the sample was obtained
- Name of CQA Monitor that obtained the sample
- Location that the sample was obtained, such as a stockpile, a fill, a borrow area, etc.
- Location testing will take place (on-site vs. off-site)
- Date sample sent off-site
- Date test results were completed on-site or received from off-site
- Name of CQA Monitor that performed the on-site testing
- Comments about the test results, such as pass / fail information

4.2.3 Sample Tagging

The CQA Monitor must maintain the identification of all samples obtained throughout the project from the time the sample is obtained to the time testing is completed. The monitor must place an identifying tag on the sample or mark the sample container with the sample number immediately upon sampling. The tag or identifying container must remain with the sample

throughout processing, testing and storage. The tag or container must have the following information:

- Sample number
- Soil material type
- Project name and project number
- Name of CQA Monitor that obtained the sample
- The date the sample was obtained

4.3 Conformance and Construction Phase Testing

Table 4-1 establishes test frequencies for earthwork CQA testing. It includes classification and conformance tests that must be performed prior to soil or rock installation to assure materials meet quality standards established in the technical specifications. In addition, Table 4-1 outlines post-construction testing to assure installed materials meet specified requirements.

The test frequencies listed establish the minimum number and intervals of required tests. Additional testing must be conducted whenever work or materials are suspect, marginal, or of poor quality. Extra testing may also be performed to provide additional data for engineering evaluation. Any re-tests performed as a result of a failing test cannot contribute to the total number of tests performed in satisfying the minimum test frequency.

Table 4-1. Earthwork Conformance and Construction Testing

Required Tests	ASTM Designation	Test Frequency
Engineered/Structural Fill Conformance Testing		
Identification and Classification of Soil Type	D2488/D2487	1 / 5,000 cy
Sieve Analysis	D6913	1 / 5,000 cy
Moisture / Density Relationship	D1557	1 / material type
Engineered/Structural Fill Construction Testing		
Identification and Classification of Soil Type	D2488/D2487	1 / 5,000 cy
Sieve Analysis	D6913	1 / 5,000 cy
Density, Nuclear Method	D6938	1 / 5,500 cy
Moisture Content, Nuclear Method	D6938	1 / 5,000 cy

Required Tests	ASTM Designation	Test Frequency
In Place Density Verification (Sand Cone Method or Drive Cylinder Method)	D1556/D2937	1 / 20 nuclear tests
Moisture Content Verification	D2216	1 / 20 nuclear tests
Module Subgrade Construction Testing		
Moisture / Density Relationship	D1557	1 / material type
Sieve Analysis	D6913	1 / 1 acre
Identification and Classification of Soil Type	D2487/D2488	1 / 1 acre
Density, Nuclear Method	D6938	1 / 1 acre
Moisture Content, Nuclear Method	D6938	1/ 1 acre
In Place Density Verification (Sand Cone Method or Drive Cylinder Method)	D1556/D2937	1 / 20 nuclear tests
Class I Dry Permeable Material Conformance Testing		
Gradation	C136/C117	1 / material type
Identification and Classification of Soil Type	D2487/D2488	1 / material type
Hydraulic Conductivity	D2434	1 / material type
Class I Dry Permeable Material Construction Testing		
Gradation	D6913	1 / 1,000 cy
Identification and Classification of Soil Type	D2487/D2488	1 / 1,000 cy
Hydraulic Conductivity	D2434	1 / 1,000 cy
Compacted Final Backfill Conformance Testing		
Identification and Classification of Soil Type	D2487	1 / material type
Sieve Analysis	C136/C117	1 / material type
Moisture / Density Relationship	D1557	1 / material type
Compacted Final Backfill Construction Testing		
Density, Nuclear Method	D6938	1 / 50 lineal feet of trench
Moisture Content, Nuclear Method	D6938	1 / 50 lineal feet of trench
Oven Moisture Content Verification	D2216	1 / 20 nuclear tests
Operations Layer Conformance Testing		
Sieve Analysis	D6913	1 / 10,000 cy
Identification and Classification of Soil Type	D2487, D2488	1 / 10,000 cy
Operation Layer Testing		
Sieve Analysis	D6913	1 / 10,000 cy

Required Tests	ASTM Designation	Test Frequency
Identification and Classification of Soil Type	D2487, D2488	1 / 10,000 cy

4.4 Excavation/Stockpiling

The excavated soil materials shall be stockpiled in the identified stockpile areas as directed by the CQA Monitor or Engineer. The CQA Monitor will visually monitor the excavation to identify soil types and confirm the soil types by sampling and visual classification. The CQA Monitor shall observe that the stockpiles conform to the requirements of the Specifications. Excavated waste shall be placed at the working face of the landfill as directed by the Engineer.

4.5 Engineered/Structural Fill Placement

The CQA Monitor shall observe that the engineered/structural fills are placed to the lines and grades shown on the Drawings.

Prior to fill placement, the CQA Monitor shall verify that all demolition, clearing, grubbing, and stripping has been performed by the Contractor in accordance with the appropriate sections of the project Specifications, this includes verifying that existing slopes over 5 feet tall with inclinations greater than 5:1 (H:V) have been properly benched and fill keys have been prepared. The CQA Monitor shall observe fill placement and perform the necessary field and laboratory testing to ensure that materials are compacted at the specified moisture content and to the minimum density specified. The CQA Monitor shall observe the placement of engineered/structural fill material in loose lifts not exceeding the thickness stated in the Specifications. The CQA Monitor shall observe that each lift of engineered/structural fill receives an adequate number of passes by compaction equipment. Tests to be performed and their frequency are provided in Table 4-1.

4.6 Module Subgrade Preparation

Prior to module subgrade preparation, the CQA Monitor shall verify removal of large or sharp materials and verify that surface is suitable for liner subgrade. Subgrade proof-rolling, smooth-drum compaction, and other preparation activities shall be observed by the CQA Monitor as required by the Specifications and this Plan. The CQA Monitor shall observe the subgrade compaction and perform the necessary field and laboratory testing to ensure that materials are compacted at the specified moisture content and to the minimum density specified and that this condition is maintained. The completed module subgrade for the synthetic liner shall be

inspected and tested by the CQA Monitor, Contractor, and/or Geosynthetics Installer to ensure that it will provide a firm and relatively smooth base for construction of the lining system in accordance with the Drawings and Specifications. Any areas observed to be excessively soft or having excessive moisture during proof-rolling shall be excavated and reworked or removed and suitable materials placed by the Contractor in accordance with the project Specifications. At the conclusion of the module subgrade preparation, the CQA Monitor shall record on an appropriate form that the subgrade is acceptable to the Installer for placement of the overlying geosynthetic materials.

4.7 Compacted Final Backfilling

The CQA Monitor shall observe that the anchor trenches and areas to receive final backfill are excavated and/or shaped to the approximate lines and grades shown on the Drawings. The CQA Monitor shall observe trench excavation to ensure it has been excavated only the distance required to carry out all geosynthetics installation in an expeditious manner. The CQA Monitor shall observe that the leading edges of the anchor trenches are rounded to minimize sharp bends in the liner material.

The CQA Monitor shall observe the compacted final backfill and placement in lifts to ensure that the work is performed in accordance with the Drawings and Specifications. The CQA Monitor shall observe that the placement and compaction techniques employed by the Contractor do not damage the geosynthetics and that any damage (if it occurs) is recorded and repaired as necessary. Any damage to the synthetic materials shall be immediately repaired in accordance with this CQA Plan and the Specifications. The CQA Monitor shall test the compacted final backfill materials in accordance with Table 4-1. The CQA Monitor shall ensure that all areas with failing tests are reworked in accordance with the Specifications until passing results are obtained.

4.8 Excavation of the Existing Liner Termination

The CQA monitor shall observe the exposing existing module liner at tie-in locations to ensure that the work is performed with caution and in accordance with the Drawings and Specifications. The contractor shall be responsible for the repair of any damage that occurs while exposing and tie-in to the existing liner. All repairs shall be recorded and observed by the CQA Monitor.

4.9 Class I Dry Permeable Material

The CQA Monitor shall verify that no material is placed until the underlying components, materials, and necessary pipes/structures have been installed and approved. The CQA Monitor shall be present at all times during placement and spreading of the class I dry permeable material. The CQA Monitor shall verify that the placement of the class I dry permeable material is in accordance with the Specifications. The CQA Monitor shall:

- Verify that underlying geosynthetic installations are complete before material installation.
- Verify that grade control is established. Observation and monitoring of hauling equipment and spreading equipment to verify that the minimum thickness is maintained for spreading and hauling equipment above the underlying geosynthetics.
- Visually observe the permeable materials as delivered to take care for variation in gradation, excess fines, or any excess angular material.
- Monitor placement of material, and mark any geosynthetics damaged during material installation.
- Verify that damage is repaired. Monitor placement of material over piping, and verify pipe is not damaged.
- In the event of pipe damage, verify damaged pipe is replaced.
- Perform sampling and construction testing of material during installation, at the frequencies established in this manual to verify material quality.
- Review of relevant submittals.
- Sampling and testing of materials for all layers in accordance with the Specifications and Table 4-1.
- Verifying thickness of material placed, by direct field measurements of in-place material and by reviewing as-built surveys.

The Contractor shall schedule placement of the class I dry permeable material during cooler parts of the day in the event of warm weather to avoid placement of materials when the liner is wrinkled. All observed damages shall be recorded by the CQA Monitor and their location clearly marked for scheduled repair. The CQA Monitor shall observe the placement of the class I dry permeable material to ensure that the Contractor follows the procedures described in the Specifications.

4.10 Operations Layer

No operations layer material shall be placed until the geosynthetics have been installed and approved by the CQA Monitor. The CQA Monitor shall obtain samples and perform conformance testing on the operations layer in accordance with the Specifications prior to installation.

The CQA Monitor and CQA Officer shall review the Contractor's list of proposed equipment and his description of the construction methods to place the operations layer over the geosynthetic materials in accordance with the Specifications.

The CQA Monitor shall continuously observe placement of the operations layer so that no materials are placed over wrinkles in the underlying geosynthetics. The thickness of the operation layer shall also be observed to ensure compliance with the Specifications.

The Contractor shall schedule placement of the operations layer material during cooler parts of the day in the event of warm weather to avoid placement of materials when the liner is wrinkled. All observed damage shall be recorded by the CQA Monitor and their location clearly marked for scheduled repair. The CQA Monitor shall observe the placement of the operations layer to ensure that the Contractor follows the procedures described in the Specifications.

The CQA Monitor shall test the operations layer during placement in accordance with Table 4-1.

4.11 Surveys and As-Builts

The CQA Officer shall review as-built survey information to confirm that minimum design thicknesses and grades are achieved prior to placement of any additional material over the prepared module subgrade and operations layer. Confirm that the specified as-built survey grid is used to confirm minimum thicknesses and lines and grades of finished surfaces. Confirm that additional survey points are obtained at grade breaks. As-built surveys and submittals shall be in accordance with requirements of the Specifications.

5. Construction Quality Assurance for Geosynthetics

This section describes CQA procedures for the installation of the geosynthetic components. The base and side slope liner will consist of a nominal 60-mil thick HDPE geomembrane overlying a low-permeability layer, consisting of a geosynthetic clay liner (GCL) with a nonwoven geotextile backing on both sides. A single-sided geocomposite will serve as the drainage layer in the base

of each module. A filter geotextile will be installed over permeable material in the LCRS and unsaturated zone sumps. Perforated and solid HDPE pipe will be installed as part of the leachate collection and removal system.

The overall goal of the geosynthetics quality assurance program is to assure that proper construction techniques and procedures are used and that the project is built in accord with the Drawings and Specifications. Another function of the quality assurance program is to identify issues that may occur during construction and to verify that these issues are avoided or corrected before construction is complete. The program includes a review of the Contractor's quality control submittals, material evaluation (conformance testing), construction testing, and construction observation. Conformance testing refers to material testing that takes place before material installation. Construction testing includes activities that occur during installation. Activities will be conducted in accord with this manual, and the approved project Construction Drawings and Specifications.

5.1 Geosynthetic Clay Liner (GCL) Quality Assurance

5.1.1 General

This section describes the observation and testing procedures required for the installation of the GCL. To monitor compliance, a quality assurance program shall be implemented that includes material conformance testing and construction observation. Conformance testing refers to those activities which shall take place prior to geosynthetic installation. Construction observation testing includes those activities which occur during geosynthetics installation.

5.1.2 GCL Shipping and Handling

The Contractor shall provide a copy of the Manufacturer's QC certificates for production of each GCL roll manufactured for this project prior to delivery for review by the CQA Monitor and CQA Officer. The certificate of compliance for the GCL must be received prior to installation as required by the Specifications. Materials shall be delivered to the site only after the CQA Officer and the Engineer receives, reviews, and approves the required submittals.

The Contractor or Installer is responsible for the transportation, off-loading and storage of the GCL. The materials shall be packaged and shipped by appropriate means so that no damage is caused and shall be delivered to the site only after the CQA Monitor receives and approves the required submittals. Off-loading shall be performed in the presence of the CQA Monitor and any

damage during off-loading shall be documented by him/her. The CQA Monitor shall keep an inventory log of all GCL delivered to the site for review by the CQA Officer.

5.1.3 GCL Conformance Testing

After production, the GCL shall be sampled for conformance testing by a third party geosynthetics laboratory. Sampling shall be performed at the manufacturing plant by the third party geosynthetics laboratory, or by the CQA Monitor upon arrival at the site. One GCL sample shall be obtained for every 100,000 square feet produced and at least one per lot. The CQA Monitor shall identify the roll numbers of the GCL which are tested for conformance on the GCL inventory log. The samples shall be delivered to the geosynthetics laboratory for testing to assess that the GCL properties conform to the requirements given in the Specifications.

Conformance samples shall be collected across the entire width of the roll, but shall not include the first three feet of the roll. The conformance samples shall be three feet wide by the roll width in length. Each sample shall be marked with the project name, Manufacturer's name, and product identification, lot number, roll number, and type (double non-woven, single side woven, non-woven, 40-mil geomembrane-backed, etc.). In event that sampling is necessary at the site, the Contractor or Installer shall provide the personnel and equipment to obtain the sample in the presence of the CQA Monitor. No material shall be deployed until representative passing conformance values are obtained by the CQA Monitor.

At a minimum, the fabric-encased GCL shall be tested for:

- Mass per Unit Area (ASTM D5993)
- Mass of Bentonite (ASTM D5933)
- Moisture Content (bentonite): ASTM D 5993
- Tensile Strength (ASTM D6768)
- Permeability (ASTM D5887)
- Flux (1 sample only) (ASTM D5887)
- Peel strength (ASTM D6496)
- Swell Index (bentonite) (ASTM D5890)
- Residual Shear Strength (1 sample only) (ASTM D 6243)

The number of specimens tested per conformance sample shall be in accordance with the respective ASTM standard. All relevant ASTM Standards shall be readily available for review. The average roll value in each direction shall be calculated from the specimen test values of each conformance sample and compared to the specified minimum average roll value of the tested physical property. The CQA Officer will review all test results and shall report any non-conformance to the CQA Monitor, the Engineer, and to the Contractor.

The GCL shall also be subjected to interface testing as described in Section 5.2.4 of this CQA Plan.

5.1.4 GCL Installation

5.1.4.1 GCL Panel Placement

Prior to GCL installation, the CQA Monitor shall verify that all underlying materials have been repaired, tested, and approved in accordance with the Drawings and Specifications. The CQA Monitor shall not allow installation of the GCL until all conformance testing has been completed and passing results have been obtained. The CQA Monitor shall give each panel an identification number, which shall be agreed to and used by the CQA Monitor and the Installer. The CQA Monitor shall establish a chart showing correspondence between roll numbers, certification reports, and panel numbers. The CQA Monitor shall record the panel number on the GCL Panel Deployment Log.

During panel placement, the CQA Monitor shall:

- Observe the GCL as it is deployed and record all defects and disposition of the defects (panel rejected, patch installed, etc.). Verify that all repairs are made in accordance with the Specifications.
- Observe that equipment used does not damage the GCL by handling, trafficking, or by other means.
- Observe that people working on the GCL do not smoke, wear shoes that could damage the GCL, or engage in any activities that could damage the GCL.
- Observe that the GCL is anchored to prevent movement by the wind (the Installer is responsible for any damage resulting to or from wind-blown geosynthetics).
- Observe there are no rocks, construction debris, or other items beneath the GCL which could cause damage and verify that the surface beneath the GCL has not deteriorated since previous acceptance.

- Observe that the GCL is not dragged across the ground surface. If the GCL is dragged across the ground surface, it shall be rejected.
- Record weather conditions including temperature, approximate wind, and humidity. Information shall be recorded at appropriate intervals throughout the day. The GCL shall not be deployed in the presence of moisture (fog, dew, mist, rain, etc.).
- Observe that the GCL is not left exposed and is protected from moisture as recommended by the Manufacturer.
- Verify that GCL panels deployed are covered the same day. GCL must be inspected and approved by CQA Monitor before covering.
- Verify that the GCL is placed with the correct sides facing up and down per manufacturer's recommendations.

The CQA Monitor shall inform the CQA Officer and the Engineer if the above conditions are not met.

5.1.4.2 GCL Field Seaming and Repairs

During GCL placement, the CQA Monitor shall observe that the Installer performs the following activities for the GCL:

- The seams are overlapped in accordance with the Drawings and Specifications.
- Bentonite is spread along the seam in accordance with the manufacturer's recommendations, Drawings, and Specifications.

The CQA Monitor shall observe the placement and seaming activities for the GCL and document all areas that require repair prior to placement of the overlying materials. All repairs are to be performed by the Installer in accordance with the manufacturer's recommendations, the Drawings, and Specifications.

5.1.5 GCL Acceptance

The Installer shall be responsible for maintaining the GCL (or portions thereof) until final acceptance by the CQA Monitor. The CQA Monitor shall recommend final acceptance when all seaming is complete, the Installer has supplied all documentation, and all laboratory testing is complete and satisfactory. Prior to final acceptance, the Installer, CQA Monitor, and the Engineer (if necessary) shall review the installation of the GCL (or portions thereof) for completeness. Any

areas that are found to deviate from the intended design, are incomplete, or in need of repair shall be recorded by the CQA Monitor for correction by the Installer. When all repairs have been completed, the CQA Monitor shall release the GCL (or portions thereof) for installation of overlying materials.

The Installer shall retain ownership of the GCL liner throughout the installation of overlying materials as defined within his scope of work and until the project is complete.

5.2 Geomembrane Quality Assurance

5.2.1 General

This section sets forth the requirements for the CQA testing and observation requirements for installing the geomembrane materials detailed on the Drawings and Specifications. This work includes the manufacturer's QC testing, conformance testing, shipping and handling, deployment, seaming, repairs, and non-destructive and destructive testing of the geomembrane liner. The Contractor shall furnish submittals in compliance with this Plan and conditions of warranty prior to construction for review by the CQA Officer and CQA Monitor.

5.2.2 Geomembrane Shipping and Handling

The Contractor shall provide a copy of the QC certificates for production of all of the geomembrane manufactured for this project prior to construction for review by the CQA Monitor and CQA Officer. The certificate of compliance for the geomembrane must be received prior to installation as required by the Specifications. Materials shall be delivered to the site only after the CQA Consultant receives and approves the required submittals.

The Contractor is responsible for the transportation, off-loading and storage of the geomembrane. The materials shall be packaged and shipped by appropriate means so that no damage is caused and shall be delivered to the site only after the CQA Monitor receives and approves the required submittals and conformance testing results. Off-loading shall be performed in the presence of the CQA Monitor and any damage during off-loading shall be documented. The CQA Monitor shall keep an inventory log of all geomembrane delivered to the site on the appropriate form for review by the CQA Officer.

Damaged materials shall be separated from undamaged materials until the CQA Monitor and CQA Officer determine proper disposition of the material. Final authority on the determination

of damage shall be the CQA Monitor. The Contractor shall replace damaged or unacceptable material at no cost to the County.

5.2.3 Geomembrane Conformance Testing

After production, the geomembrane shall be sampled for conformance testing by a third party geosynthetics laboratory. Sampling shall be performed at the manufacturing plant by the third party geosynthetics laboratory, or by the CQA Monitor upon arrival at the site. One geomembrane sample shall be obtained for every 100,000 square feet produced per lot. The CQA Monitor shall identify the roll numbers of the geomembrane that are tested for conformance on the inventory log of geomembrane received. The samples shall be delivered to the geosynthetics laboratory to conduct specified tests to assess whether the geomembrane properties conform to the requirements given in the Specifications. The CQA Officer shall review all test results and report any non-conformance test results to the Contractor, Engineer, and the CQA Monitor. Third party geosynthetics testing shall be performed by a GSI accredited laboratory.

Conformance samples shall be collected across the entire width of the roll, but shall not include the first three feet of the roll. The conformance samples shall be three feet wide by the roll width in length. Each sample shall be marked with the project name, Manufacturer's name and product identification, lot number, roll number, and type (HDPE, LLDPE, 60-mil, double-textured, single-textured, etc.). In event that sampling is necessary at the site, the Contractor shall provide the personnel and equipment to obtain the sample in the presence of the CQA Monitor. No material shall be deployed until passing conformance values are obtained by the CQA Monitor.

The conformance testing shall include the following parameters:

- Sheet Thickness (ASTM D5994)
- Asperity Height (ASTM D7466)
- Specific Gravity (ASTM D1505)
- Tensile Properties (ASTM D6693)
- Tear Resistance (ASTM D1004)
- Puncture Resistance (ASTM D4833)
- Carbon Black Content (ASTM D1603)
- Carbon Black Dispersion (ASTM D5596)

- Interface Shear (ASTM D5321/D6243)

5.2.4 Interface Shear Testing

For each separately run lot of HDPE Geomembrane manufactured for this project (a lot is a group of consecutively numbered rolls from the same manufacturing line), the Contractor shall allow the CQA Consultant to provide for interface shear testing for interface strength in accordance with ASTM Standard D5321 "Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic Friction by the Direct Shear Method" and in the case of GCL, conduct interface direct shear testing in accordance with ASTM D6243 "Standard Test Method for Determining the Internal and Interface Shear Resistance of Geosynthetic Clay Liner by Direct Shear Method." Issues and procedures related to soil preparation shall be governed by ASTM D3080 "Standard Method for Direct Shear Test of Soils Under Consolidated Drained Conditions." The laboratory testing equipment shall be capable of providing:

- Total strain of at least 2 inches
- Constant rate of strain
- Minimum test sample size of 12-inches by 12-inches
- Means of producing and maintaining "saturated" conditions

The Contractor shall arrange for the sampling and documentation of samples of geosynthetic materials approved for the project, arrange for appropriate soil samples (subgrade preparation layer and side slope operations layer in the presence of the Engineer), and shall arrange for shipment of the samples to an independent GI-approved testing laboratory for direct shear testing. Procedures presented in Section 7.5.2 of ASTM D3080 shall be used to prepare soil test specimens at ninety (95) percent of the maximum dry density as established by ASTM D1557. The samples shall be maintained at a moisture content of 2 percent above optimum content (ASTM D1557) for direct placement in the shear box. Shearing shall take place once the sample is fully consolidated.

The geomembrane shall meet the interface shear strength requirements of Table 5-2 and be tested at a frequency of two tests per test configuration (three samples under different normal stress increments as specified). Testing at each of the normal stresses shall be undertaken on individual samples, i.e. multi-stage testing of the sample will not be allowed.

Table 5-2. Minimum Acceptable Large Displacement Interface Shear Strength Values

Test Configuration	Test	Test Condition	Hydration Time Prior to Shearing	Strain Rate (inch/min)	Min. Shear Displacement (in)	Normal Load (psf)	Residual Shear Strength (psf)[1]
Upper Suface of GCL / Textured Lower Surface of Geomembrane [2]	ASTM D 6243	Submerged	48 hours under corresponding normal load	0.04	3.0	2,500 5,200 7,500	500 1,000 1,000
Smooth Upper Surface of Geomembrane / Lower Surface of Geocomposite [3]	ASTM D 5321	Submerged	None	0.2	3.0	2,500 5,200 7,500	500 1,000 1,000
Lower Surface of GCL / Subgrade [2]	ASTM D 6243	Submerged	48 hours under corresponding normal load	0.04	3.0	2,500 5,200 7,500	500 1,000 1,000

[1] The normal load shall be applied in a single increment.

[2] The internal shear strength of the GCL should be tested simultaneously by placing in a floating configuration.

[3] The internal shear strength of the geocomposite should be tested simultaneously by placing in a floating configuration.

[4] Vertical displacements shall be monitored. Hydration is complete when the specimen reaches equilibrium.

A detailed laboratory test report consistent with ASTM D6243 procedures shall be submitted and, at a minimum, shall include:

- Initial and final moisture content and density
- Any deviations or peculiarities in test
- Vertical displacement (i.e. displacement in the plane perpendicular to the shear direction) vs. time during submergence, compression/consolidation and shearing
- Shear stress versus shear strain
- Interpreted strength values

The laboratory test report shall also describe the observed condition of the geomembrane specimens after testing. This shall include:

- Clamping method and any deformation that occurred during testing

- Abrasion of geomembrane
- Elongation of geomembrane
- Other physical changes in material such as wrinkling
- Differential movement between specimen and contact surfaces
- Tilting

The laboratory testing data must demonstrate the minimum interface friction strength of the composite section and shall be included in the final CQA Report. This adequacy shall be determined during a review completed by the CQA Officer with concurrence by the Engineer.

All costs associated with interface shear interface testing shall be borne by the CQA Consultant.

5.2.5 Geomembrane Placement

Prior to placing the geomembrane panels, the Contractor and CQA Monitor shall observe that the GCL has been properly installed, finished, and accepted. Once the GCL has been approved and accepted, deployment of the geomembrane may begin. The Installer's QC Technician shall assign and mark each panel with a unique identification number that shall be used by all parties. The CQA Monitor shall record the placement of each panel on a geomembrane panel deployment log form to be reviewed by the CQA Officer. The CQA Monitor shall observe that the Installer has provided sufficient slack in the geomembrane to allow for contraction due to cold temperatures. The CQA Monitor shall record the ambient temperatures during seaming operations. As the geomembrane panels are deployed in the field, the CQA Monitor shall observe and observe and document the following:

- That the GCL beneath the geomembrane has not been damaged or hydrated since previous acceptance.
- That any underlying geosynthetics have been repaired and approved as necessary.
- Equipment cannot be driven directly over geosynthetics.
- That the equipment used to transport and deploy the geomembrane does not damage the geomembrane or the GCL.
- That there are no significant defects present in the sheet. Small defects shall be marked, along with the type of repair required (extrudate, patch, etc.) and tracked in the repair log.

- That the sheet is not deployed under adverse weather conditions such as fog, rain, high winds, or extreme temperatures.
- That the equipment and deployment methods do not cause excessive wrinkling of the geomembrane and that the sheet is not dragged along a rough surface. If the liner is dragged, the CQA Monitor shall inspect the underside of the material for damage. Geomembrane that is scored beyond reasonable repair effort shall be rejected.
- That personnel do not engage in activities that could damage the geomembrane.
- That no more panels are deployed than can be seamed on the same day.
- That the Installer's QC personnel properly record identification information including roll number, panel number, seam number, date, etc.
- That the Installer's QC personnel prepare an as-built panel layout drawing.

The CQA Monitor shall record all of the above information in daily reports and log sheets and shall inform all parties of any deviations.

5.2.6 Geomembrane Test Welds

The Installer shall conduct field test welds on pieces of scrap liner prior to production welding at the following frequency. The CQA Monitor shall observe that the Installer conducts test welds in accordance with the Specifications.

The CQA Monitor shall record the shear and peel test results for the test weld coupons on a geomembrane start-up trial weld log form. The Installer shall not begin welding of field seams unless the CQA Monitor has verified that the trial welds are acceptable. Once a welding technician has been approved on a specific welding apparatus, he may not change machines without first passing a test weld on the new equipment.

5.2.7 Geomembrane Seaming

The CQA Monitor shall observe that the geomembrane is seamed between the minimum and maximum ambient temperatures described within the Specifications. The CQA Monitor shall measure and record the temperature in accordance with the Specifications.

The CQA Monitor shall observe that the geomembrane is not being deployed during precipitation, in the presence of excessive moisture, in areas of ponded water, or in the presence of excessive winds.

The Installer's QC Technician and the CQA Monitor shall observe that geomembrane seams are oriented parallel to the maximum slope direction and that a seam numbering system compatible with the panel numbering system is used. The CQA Monitor shall observe that the Installer has taken the following steps prior to seaming the geomembrane:

- That the liner surface has been cleaned of all foreign material including dirt, dust, debris, moisture, or oil.
- That grinding has been performed to remove the oxidation (extrusion welds only).
- That all areas where the sheet thickness has been thinned below the specified value from grinding are patched by the Installer.
- That any bead grooves are covered with single extrudate.
- That wrinkles and fishmouths are cut out, the edges overlapped properly, and patched.
- That all seaming takes place over a firm, dry surface.
- That when the ambient temperature is below the prescribed temperature, a hot air device is used for preheating in front of the welder.
- That the approved type and quantity of welding devices are used on the job.
- That extrusion welders are purged of heat degraded material prior to use.
- That for cross or tee seams, the edge of the seam is ground to a smooth incline.
- That the seam numbering system and welding procedures agreed upon at the pre-construction meeting are strictly followed.

The CQA Monitor shall record the above information in his daily reports along with panel placement and seaming log forms to be reviewed by the CQA Officer.

5.2.8 Geomembrane Extrusion Welding

For extrusion welding, the CQA Monitor shall observe that the welding devices are purged of heat-degraded extrudate as described in the Specifications. All purged extrudate shall be disposed of off the liner. Each extruder shoe shall be inspected daily for wear to assure that its offset is equal to the liner thickness. All worn or damaged shoes or other parts shall be repaired. The CQA Monitor shall observe that no equipment is allowed to begin welding until the test weld, made by that equipment, passes the weld test. All test weld results shall be reviewed and recorded by the CQA Monitor.

5.2.9 Geomembrane Hot Wedge (Fusion) Welding

For hot wedge (fusion) welding, the CQA Monitor shall observe that the welding devices are automated, vehicular mounted, and equipped with gauges giving applicable speed, temperatures, and pressures. The speed, temperature, and pressure of the welding device should be determined during the test welding conducted prior to seaming of the panels.

5.2.10 Geomembrane Seam Nondestructive Testing

Prior to the start of construction, the Installer shall submit to the CQA Officer for approval, as per the specifications, a procedure for nondestructive testing of all field seams. When the seam testing begins in the field, the CQA Monitor shall maintain a log of nondestructive testing for all seams. The geomembrane QC conducted by the Installer shall also be recorded on the installer's field QC log form and marked on the liner.

5.2.11 Geomembrane Vacuum Box Testing

For nondestructive seam testing, all extrusion welded field seams shall be tested over their full length using vacuum box test units. The vacuum testing shall be performed by the Installer's QC Technician under the observation of the CQA Monitor. The CQA monitor does not need to observe each vacuum box test, but shall check periodically on the methods and equipment used and record all results as marked on the liner. The CQA Monitor shall observe that the tests are conducted concurrently with the field seaming and that the vacuum box assembly consists of a rigid box with a transparent viewing window and a vacuum gauge. The CQA Monitor shall observe that the Installer's procedure for vacuum testing is as follows:

- Clean window, gasket surfaces, and check box for leaks.
- Energize vacuum pump and set to the proper pressure as required by the Specifications.
- Place soapy solution on section of seam to be tested.
- Place box over wetted area and press down.
- Close bleed valve, open vacuum valve, and ensure that a leak tight seal is created.
- Examine the length of weld through the viewing window for bubbles for the period described in the Specifications.
- Dwell time must not be less than 15 seconds.
- If no bubbles appear, the vacuum valve should be closed, the bleed valve opened, and the box should be moved to the next adjoining area with the specified overlap.

- Areas where soap bubbles are detected shall be marked as defects, repaired, and retested.

5.2.12 Geomembrane Air Pressure Testing

If the double hot wedge seaming system is employed, air pressure testing shall be used. The CQA Monitor shall observe that air pressure testing is conducted by the Contractor as follows:

- Seal both ends of the seam to be tested.
- Insert a hollow needle or other approved pressure feed device into the tunnel created by the double hot wedge and insert a protective cushion between the air pump and geomembrane.
- Energize the air pump to the pressure specified, close the valve, and sustain the pressure for the specified time period.
- Check the continuity of the entire seam being tested for indications that it has been fully pressurized to 30 psi. This shall be accomplished by opening the air channel at the opposite end of the seam and observing a loss of pressure either before or after the test.
- A 2-minute relaxing period is allowed for the pressure to stabilize. The air chamber must sustain the pressure for 5 minutes without losing more than 2 psi.
- If a loss of pressure exceeds the specified value or does not stabilize, locate the faulty area and repair.
- Remove the approved pressure feed device and repair.

At a minimum the opening of the air channel of each seam shall be observed by the CQA Monitor. Should a loss of pressure be detected along a seam, the faulty area shall be identified, repaired, and re-tested as provided within the Specifications.

If blockage occurs along the seam, the area shall also be identified, repaired and re-tested. The Installer shall be responsible for all costs associated with the seam repair. The results of both vacuum box and air pressure testing shall be recorded on the panel and the seam QC form by the Installer. The CQA Monitor shall also maintain a nondestructive testing log for review by the CQA Officer.

5.2.13 Geomembrane Seam Destructive Testing

The CQA Monitor shall determine the location of all destructive tests, mark the sample boundary on the geomembrane, and note the location on the seam log. The CQA Monitor shall obtain a minimum of one sample per 500 feet of seam per welding apparatus. The Installer shall repair any suspicious looking welds before release of a seam for destructive sampling. Destructive samples shall be cut by the Installer as the installation progresses and not at the completion of the project. The Installer's QC Technician shall mark all destructive samples with consecutive numbers along with the seam number. The CQA Monitor shall keep a destructive testing log with the date, time, location, seaming technician, apparatus, temperature, and pass or fail criteria. The CQA Monitor shall observe that all destructive sample holes are repaired promptly by the Installer.

The Installer's QC Technician shall cut destructive samples at locations selected by the CQA Monitor. Samples dimensions shall be 12 inches wide by 48 inches long centered on the seam. The CQA Monitor shall:

- Mark each sample location with the sample bounds (48 inches by 12 inches), sample ID, technician ID, machine ID, date, and seam number, and the adjoining panel numbers.
- Record the sample location on the as-built geomembrane panel layout drawing and the geomembrane field seaming log form.
- A maximum frequency must be agreed to by the Contractor and CQA Monitor at the preconstruction meeting. However, if the number of failed samples exceeds 5 percent of the tested samples, this frequency may be increased at the discretion of the CQA Monitor. Samples taken as the result of failed tests do not count toward the total number of required tests.
- Test locations are at the discretion of the CQA Monitor and may be selected on the basis of liner distortion, weld contamination, or other potential areas of poor seaming.
- Record the sample location and reason for taking the sample (random sample, poor welding, etc.) on the destructive testing log.
- Promptly ship the destructive samples to the testing laboratory for testing.
- Record the results of the testing on the destruction testing summary form.
- In the event of testing failure, track the welding performed by the welding apparatus 50 feet before and after the failed sample location, and obtain additional samples. Continue

tracking until the failed sample(s) are bounded by passing tests. Log the tracking on destructive test tracking form.

- Confirm that Installer caps or reconstructs the failed seam.

5.2.14 Geomembrane Repairs

For final inspection, the CQA Monitor and Installer shall check the seams and surface of the geomembrane for defects, holes, blisters, undispersed raw materials, or signs of contamination by foreign matter. If dirt inhibits inspections, the Installer shall brush, blow, or wash the geomembrane surface as required. The CQA Monitor shall decide if cleaning the geomembrane surface and welds is needed to facilitate inspection. Repair areas shall be distinctively marked with a description of the required type of repair and logged.

The CQA Monitor shall observe that all identified holes, tears, blisters, undispersed raw materials, and contamination by foreign matter are patched. The CQA Monitor shall observe that patches are not cut with the repair sheet in contact with the geomembrane and that the patches are extrusion welded to the geomembrane and then vacuum tested. The result of the vacuum test for the repair shall be marked by the Installer's QC Technician with the date of the test and name of the tester on the sheet. Holes less than a quarter of an inch may be sealed with extrudate as described in the Specifications. The CQA Monitor shall record all repair areas on the repair log form.

5.2.15 Geomembrane Acceptance

The Installer shall be responsible for maintaining the geomembrane (or portions thereof) until final acceptance by the CQA Monitor. The CQA Monitor shall recommend final acceptance when all seams have passed destructive testing, the Installer has supplied all documentation, and all field and laboratory testing is complete and satisfactory. Prior to final acceptance, the Installer, CQA Officer, CQA Monitor, and the Installer shall review the installation of the geomembrane (or portions thereof) for completeness. Any areas that are found to deviate from the intended design, are incomplete, or in need of repair shall be recorded by the CQA Monitor for correction by the Installer. When all repairs have been completed and all required Contractor-supplied documentation has been received and reviewed the CQA Monitor shall release the geomembrane (or portions thereof) for installation of overlying materials.

The Installer shall retain ownership of the liner throughout the installation of overlying materials as defined within his scope of work and until the project is complete.

5.3 Geocomposite Quality Assurance

5.3.1 General

This section sets forth the requirements for the CQA testing and observation requirements for installing the geocomposite materials detailed on the Drawings and Specifications. This work includes the examination of the Manufacturer's and Contractor's QC testing, conformance testing, shipping and handling, and deployment, seaming, and repairs of the geocomposite. The CQA Monitor and CQA Officer shall review the submittals furnished by the Contractor and/or Installer to ensure their compliance with this program and conditions of warranty prior to construction. They shall also review the time schedule for installation submitted by the Contractor prior to construction.

5.3.2 Geocomposite Shipping and Handling

The Contractor shall provide a copy of the Manufacturer's QC certificates for production of each geocomposite roll manufactured for this project prior to construction for review by the CQA Monitor and CQA Officer. Materials shall be delivered to the site only after the CQA Monitor receives and approves the required submittals. The Manufacturer's QC shall include visual inspection of the geocomposite materials for foreign matter and needles. Detection of broken needles at the manufacturing plant shall be accomplished with the use of magnets and continuous metal detectors permanently installed on-line at the factory.

The Contractor is responsible for the transportation, off-loading, and storage of the geocomposite. The materials shall be packaged and shipped by appropriate means so that no damage is caused and shall be delivered to the site only after the CQA Monitor receives and approves the required submittals. Off-loading shall be performed in the presence of the CQA Monitor to ensure that any damage during off-loading is properly documented. The CQA Monitor shall keep an inventory log of all geocomposite delivered to the site on the appropriate form for review by the CQA Officer.

The CQA Monitor shall verify that damaged materials are separated from undamaged materials until proper disposition of the material is determined by the County or CQA Officer. Final authority on the determination of damage shall be the CQA Monitor.

5.3.3 Geocomposite Conformance Testing

After production, the geocomposite shall be sampled for conformance testing by a third party geosynthetics laboratory. Sampling shall be performed at the manufacturing plant by the third

party geosynthetics laboratory or CQA Monitor upon arrival at the site. One geocomposite sample shall be obtained for every 100,000 square feet produced per lot. The CQA Monitor shall identify the roll numbers of the geocomposite which are tested for conformance on the log of geocomposite received form. The samples shall be delivered to the geosynthetics laboratory for testing to assess that the geocomposite properties conform to the requirements given in the Specifications. The CQA Officer shall review all test results and report any nonconformance test results to the Contractor, Installer, Engineer, and the CQA Monitor.

Conformance samples shall be collected across the entire width of the roll, but shall not include the first three feet of the roll. The conformance samples shall be three feet wide by the roll width in length. Each sample shall be marked with the project name, Manufacturer's name and product identification, lot number, roll number, and type. In event that sampling is necessary at the site, the Contractor shall provide the personnel and equipment to obtain the sample in the presence of the CQA Monitor. No material shall be deployed until passing conformance values are obtained by the CQA Monitor.

The conformance testing of the geocomposite shall include the following parameters:

- Transmissivity (ASTM D4716)
- Ply Adhesion (ASTM D7005)

The geocomposite shall also be subjected to interface testing as described in Section 5.2.4 of this CQA Plan.

5.3.4 Geocomposite Installation

Prior to geocomposite installation, the CQA Monitor shall observe that all underlying materials have been repaired, tested, and approved in accordance with the Construction Drawings and Specifications. The CQA Monitor shall not allow installation of the geocomposite until all conformance testing has been completed and passing results have been obtained. During geocomposite placement, the CQA Monitor shall:

- Observe the geocomposite as it is deployed and record all defects and disposition of the defects (panel rejected, patch installed, etc.).
- Observe that equipment used does not damage the geocomposite.
- Observe that people working on the geocomposite do not engage in activities that could damage it.

- Observe that the geocomposite is anchored to prevent movement by the wind (the Installer is responsible for any damage resulting to or from wind-blown geocomposite).
- Observe that the seams are overlapped in accordance with the Specifications.
- Observe that the Installer has repaired any holes or tears in the geocomposite.
- Observe that the materials and methods used to fasten the panels together meet the Specification requirements.
- Verify that geocomposite is covered within 14 days. If geocomposite is exposed for more than 14 days, ultraviolet exposure conditions will be reviewed.

The CQA monitor shall record all of the above information on log sheets and in daily reports.

5.3.5 Geocomposite Repairs

The CQA Monitor shall observe the placement of the geocomposite and document all areas that require repair prior to placement of the overlying materials. All repairs are to be performed by the Installer in accordance with the manufacturer's recommendations, the Drawings, and Specifications.

5.4 Geotextile Quality Assurance

5.4.1 General

This section sets forth the requirements for the CQA testing and observation requirements for installing the geotextile detailed on the Drawings and Specifications. The Contractor shall furnish submittals in compliance with this manual and conditions of warranty prior to delivery for review by the CQA Officer, Engineer, and CQA Monitor. The Contractor shall also prepare and submit a time schedule for installation, including complete testing and acceptance of materials prior to construction.

5.4.2 Geotextile Shipping and Handling

The Contractor shall provide a copy of the certificate of compliance and the QC certificates for production of each geotextile roll manufactured for this project prior to construction for review by the CQA Monitor, Engineer, and CQA Officer. Materials shall be delivered to the site only after the CQA Consultant and the Engineer receives, reviews, and approves the required submittals.

The CQA Monitor shall ensure that the materials were packaged and shipped by appropriate means so that no damage was caused to the materials delivered to the site. Off-loading shall be done in the presence of the CQA Monitor and any damage during off-loading shall be documented by the CQA Monitor and the Installer. The CQA Monitor shall keep a log of all geotextile delivered to the site on a geotextile inventory log form.

Damaged materials shall be separated from undamaged materials until the CQA Monitor determines proper disposition of material. Final authority on the determination of damage shall be the CQA Monitor. The Contractor shall replace damaged or unacceptable material at no cost to the County.

The geotextile shall be stored on a prepared surface approved by the CQA Monitor and shall be protected from puncture, precipitation, dirt, grease, water, mechanical abrasions, excessive heat, ultraviolet light exposure or other damage. The CQA Monitor shall observe that the Installer uses appropriate handling equipment to load, move or deploy the material to ensure that no damage is caused to the material during handling of the geotextile.

5.4.3 Geotextile Conformance Testing

After production, the geotextile shall be sampled for conformance testing by a third party geosynthetics laboratory. Sampling shall be performed at the manufacturing plant by the third party geosynthetics laboratory, or by the CQA Monitor upon arrival at the site. One geotextile sample shall be obtained for every 100,000 square feet produced and at least one per lot. The CQA Monitor shall identify the roll numbers of the geotextile which are tested for conformance on the inventory log of geotextile received. The samples shall be delivered to the geosynthetics laboratory and tested to assess that the geotextile properties conform to the requirements given in the Specifications. The CQA Monitor shall review all test results and report any non-conformance test results to the Contractor and the CQA Officer.

The CQA Monitor shall collect samples for conformance testing across the entire width of the roll, but shall not include the first 3 feet of the roll. The conformance samples shall be 3 feet wide by the roll width in length. The CQA Monitor shall mark on each roll the project name, Manufacturer's name, product identification, lot number, roll number, roll dimensions, machine direction, and roll side (inside/outside).

In event that sampling is necessary at the site, the Installer shall provide the personnel and equipment to obtain the sample in the presence of the CQA Monitor. No material shall be deployed until representative passing conformance values are obtained by the CQA Monitor.

The third party geosynthetics laboratory shall conduct the following conformance tests on the geotextile:

- Mass per unit area (ASTM D5261)
- Grab Tensile Strength (ASTM D4632)
- CBR Puncture Resistance (ASTM D6241)
- AOS (ASTM D4751)
- Permittivity (ASTM D4491)
- Trapezoidal Tear (ASTM D4533)

The geotextile shall also be subjected to interface testing as described in Section 5.1.4 of this CQA Plan.

5.4.4 Geotextile Installation

The CQA Monitor shall not allow installation of the geotextile until all conformance testing has been completed and passing results have been obtained. During geotextile placement, the CQA Monitor shall:

- Observe the geotextile as it is deployed and record all defects and disposition of the defects (panel rejected, patch installed, etc.).
- Observe that equipment used does not travel on or damage the underlying geosynthetics.
- Observe that people working on the geotextile do not engage in activities that could damage it.
- Verify that the geotextile is anchored to prevent movement by the wind (the Installer is responsible for any damage resulting to or from windblown geotextile).
- Observe that the seams are overlapped and seamed in accordance with the project Specifications.
- Observe that the Installer has repaired any holes or tears in the geotextile.
- During installation, the Installer and CQA Monitor shall inspect the geotextile as it is deployed for the presence of foreign materials and needles.

If any needles or other materials which the CQA Monitor feels may be detrimental to the underlying synthetic liner are present within the geotextile, the roll shall be rejected and shipped off-site permanently and the Installer shall replace any rejected material at no additional cost to the County. The CQA Monitor shall notify the Installer of any issue areas and observe and inspect the repair. The CQA Monitor shall record all of the above information on log sheets and in daily reports.

5.4.5 Geotextile Acceptance

The Installer shall be responsible for maintaining the geotextile (or portions thereof) until final acceptance by the CQA Officer. The CQA Officer shall recommend final acceptance when all seaming has been completed, the Installer has supplied all documentation, and all laboratory testing is complete and satisfactory. Prior to final acceptance, the Installer, CQA Monitor, CQA Officer, and the Engineer shall review the installation of the geotextile (or portions thereof) for completeness. Any areas that are found to deviate from the intended design, are incomplete, or in need of repair shall be recorded by the CQA Monitor for correction by the Installer. When all repairs have been completed, the CQA Officer shall release the geotextile (or portions thereof) for installation of overlying materials.

The Installer shall retain ownership of the geotextile throughout the installation of overlying materials as defined within his scope of work and until the project is complete.

5.5 Geoelectric Leak Location Survey

A geoelectric leak location survey shall be completed by the CQA Consultant. The CQA Consultant may be the Leak Location Consultant if the CQA Consultant has the required qualifications to perform the survey. The CQA Consultant may hire a qualified Leak Location Consultant to perform the survey. . The Contractor will provide support to the Geoelectric Leak Location Consultant. Two geoelectric leak detection surveys will be completed. One of the tests will be performed following installation of the 60 mil HDPE geomembrane liner; the other test will be completed following the placement of the overlying operations layer soil. The CQA Officer and Monitor shall ensure that the liner is properly prepared for the ELLS and shall verify that adequate moisture is added to the permeable material or geocomposite and operations layer prior to conducting the test. All edges of the liner must be "electrically isolated" prior to completing the tests. The geoelectric leak location survey shall conform to the requirements of ASTM D 7002 or ASTM D 7007, as applicable.

The CQA Officer/Monitor shall:

- Review the qualifications of the Geoelectric Leak Location Consultant to assess conformance with the qualification requirements stated in this CQA Plan and in the project Special Provisions. If the CQA Consultant elects to perform the survey, the CQA Consultant shall provide the required qualifications to the Engineer for review.
- Review the Geoelectric Leak Location Work Plan to assess conformance with the requirements of the CQA Plan and project Special Provisions.
- Identify any discrepancies in the Geoelectric Leak Location Work Plan and ensure that they are corrected prior to commencement of the leak location survey.
- Verify that the site has been inspected by the Geoelectric Leak Location Consultant prior to commencing the leak location survey.
- Verify that the first phase of the leak location survey, conducted on the bare geomembrane, is in conformance with the ASTM standards or procedures prescribed in the work plan.
- Verify that calibration testing has been performed periodically with an actual hole on the geomembrane for proper equipment operation. If a hole is not detected during the verification testing, the hole will be repaired, and the geomembrane area surveyed since the previous verification test will be resurveyed.
- Prepare documentation that the first phase of the leak location survey is completed, all defects have been repaired, and the surveyed area is turned over to the Contractor and/or Installer for subsequent installation of geosynthetics and soil cover over the geomembrane.
- Observe proper placement of additional geo synthetic layers and operations soil over the geomembrane liner.
- Verify that the second phase of the leak location survey, conducted on the soil operation layer, is in conformance with the ASTM standards or procedures prescribed in the work plan.
- Verify that a calibration test with an actual hole is performed for the second phase of the leak location survey. The hole shall be placed on top of the geocomposite, and then

covered with the operations layer soil. Leak detection survey measurements must be demonstrated with the calibration hole located midway between data measurement locations.

- Verify and observe leak survey measurement above the calibration hole to determine detection sensitivity and maximum grid spacing.
- Determine when required, if an actual hole in the geomembrane lining may be needed by the Geoelectric Leak Location Consultant in order to calibrate the electrical survey. Calibration to an actual hole in the geomembrane shall only be performed when equipment is on- site to immediately repair the hole after calibration.
- Verify the locations of all identified or indicated leaks with flags, spray paints, or written coordinates prepared by the Leak Location Consultant.
- Review the Geoelectric Leak Location Consultant's written report of the surveys and confirm that it accurately represents the surveys. In the event that discrepancies are identified, ensure that they are corrected by the Leak Location Consultant.

In the event the surveys identifies anomalies that are indicative of a defect in the liner system, the CQA Monitor shall document the location of the suspect area, and then observe and document the exposure of the liner system and any subsequent repairs that may be necessary. The CQA Monitor will photograph the area after it is exposed and after any repairs are completed.

The Geoelectric Leak Location Consultant shall submit a report detailing the procedures used and the results of their survey within 2 weeks of completion outlining:

- Principles of technique
- Site activities
- Map of defect locations
- Description of defects, if known
- Certification that any defective areas were successfully repaired
- Certification that the entire geomembrane area was surveyed

6. HDPE Pipe Quality Assurance

6.1 General

This section covers all HDPE pipe material supply and installation CQA, including CQA of all leachate collection pipes. The Contractor shall provide a copy of the certificate of compliance for production of the piping manufactured for this project prior to delivery for review by the CQA Monitor, CQA Officer, and Engineer.

6.2 HDPE Pipe Delivery

The CQA monitor shall observe verify that:

- Materials shall be delivered to the site only after the CQA Monitor receives and approves the required submittals.
- The CQA Monitor shall ensure that the materials were packaged and shipped by appropriate means so that no damage was caused to the materials delivered to the site.
- Off-loading shall be done in the presence of the CQA Monitor and any damage during off-loading shall be documented by the CQA Monitor and the Contractor.
- The CQA Monitor shall keep a log of all piping delivered to the site on an inventory log of piping received.
- Damaged materials shall be separated from undamaged materials until the CQA Monitor determines proper disposition of the material.
- All pipes shall be stored and stacked on a prepared surface as per Manufacturer's recommendation and approved by the CQA Monitor and shall be protected from puncture, precipitation, dirt, grease, water, mechanical abrasions, or other damage.
- The Contractor uses appropriate handling equipment to load, move or deploy the material to ensure that no damage is caused to the materials during handling of the piping.
- No leachate collection piping shall be placed until the synthetic liner has been installed and approved by the CQA Monitor.
- No piping is installed in a manner that could damage the underlying geosynthetic liner. The CQA Monitor shall record all observed damages and clearly mark their location for scheduled repair.

- Pipes are correct sizes and perforations (for perforated pipes) are in accordance with the Drawings.

Final authority on the determination of damage shall be the CQA Monitor. The Contractor shall replace damaged or unacceptable material at no cost to the County.

6.3 HDPE Pipe Installation

The CQA Monitor shall verify and observe that:

- Trenches are excavated to the lines and grades shown in the Drawings and are free of debris prior to pipe laying.
- Piping is installed to the lines and grades shown on the Drawings.
- Pipe jointing is in accordance consistent with the Manufacturer's recommendations and Specifications.
- Pipe bedding is installed per Specifications and Drawings.
- Backfilling is installed per Specifications and testing is in accordance with Table 4-1.

7. Quality Assurance for Other Improvements

This section describes CQA procedures for other improvements such as electrical and mechanical features associated with the sump control panels. Specific requirements for these features are included in the Drawings.

7.1 Sump Control Panels and Electrical Components

Review the Contractor's approved material submittals to verify compliance with the Specifications. Determine and note corrective action items if applicable.

- Verify that the control panel, conductors, conduit, fittings, pullboxes, junction boxes, cable, receptacles, circuit breakers, disconnect switches, and motor starters are in compliance with the Specifications.
- Verify that all panels, enclosures and conduit supports, racks, frames and structures are suitable for weight, lateral loads and stresses (including seismic), and are properly assembled and anchored.

- Verify all above grade conduit supports and clamps are properly secure and that they meet the minimum spacing requirements.
- Verify the correct location and application of hazardous location conduit seals and compound meet industry standards such that the migration of hazardous and explosive gasses is prevented.
- Verify that signal conductors and power conductors do not share common raceways, pullboxes, or junction boxes.
- Verify that conductors are continuous and that splices do not occur outside of pullboxes, junction boxes, or other similar approved equipment.
- Verify that installed conduit is of the size indicated and is not crushed or deformed.
- Verify that all conduits are capped with a watertight seal from the installation until the conductors are pulled through. The watertight caps for spare conduits shall remain.
- Verify that adequate working clearances and dedicated electrical spaces are maintained around electrical equipment.
- Verify that intrinsically safe conductors maintain minimum separation from power and non-intrinsically safe conductors.
- Verify that the instrumentation and controls system is fully tested as detailed in the Specifications. The sequence test and calibration shall be performed prior to any functional acceptance testing.

8. Work Deficiencies

When deficiencies are discovered, the CQA Monitor shall immediately determine the nature and extent of the issue, notify the Contractor of the issue, and complete the required documentation. The CQA Monitor shall notify the Contractor within 1/2 hour of discovering any deficiency or at the earliest time possible. If the deficiency will cause construction delays or require substantial rework, the CQA Monitor shall notify the Engineer and the CQA Officer.

The Contractor shall correct the deficiency to the satisfaction of the CQA Monitor. If the Contractor is unable to correct the issue, the CQA Monitor shall be asked to develop and recommend a solution to the CQA Officer for his approval.

The corrected deficiency shall be retested before the Contractor performs additional work. All retests and the steps taken to correct the issue shall be documented by the CQA Monitor on a field construction inspection report and on construction issue and solution data sheet forms.

9. Documentation

9.1 Daily Records

At a minimum, daily records shall consist of field notes, a summary of the daily construction activities, associated testing activities, and observation and data sheets. All project records shall be maintained in a well-organized project file at the job site and shall be available for review by the CQA Officer, Contractor, and the Engineer at all times. The CQA Officer shall review the reports and field notes prepared by the CQA Monitor. The CQA Monitor's daily summary report shall be available to the CQA Officer and the Engineer for review and shall include the following information:

- Date, project name, and location
- Weather data
- A description of on-going construction
- A summary of test results identified as passing, failing, or in the event of a failed test, retests
- Off-site materials received including geosynthetics or drainage materials, plus status of certificates or off-site testing for the materials
- A summary of decisions regarding acceptance of the work and/or corrective actions taken
- The signature of the CQA Monitor

9.2 Observation and Test Data Sheets

The CQA Monitor shall prepare observation and data sheets during all phases of construction for review by the CQA Officer. Observation and data sheets for this project may include, but may not be limited to the following:

- Nuclear Field Density Data Sheets

- Soil Laboratory Test Data Sheet (Sieve, Proctor, and Moisture Content)
- Acceptance of Prepared Module Subgrade Forms
- Inventory Log of Geomembrane Received
- Inventory Log of GCL Received
- Inventory Log of Geocomposite Received
- Inventory Log of Geotextile Received
- Inventory Log of Piping Received
- Geomembrane Field Seaming and Nondestructive Test Log
- Geomembrane Panel Deployment Log
- Geomembrane Start-up Test Weld Log
- Geomembrane Defect and Repair Log
- Geomembrane Destructive Seam Strength Test Results and tracking form
- Geomembrane as-built panel layout sketches
- GCL Panel Deployment Log

Refer to Appendix B for CQA field forms. Additional observation and data sheets may be required. All entries shall be clear and legible. All documentation should be dated and signed or initialed clearly by the CQA Monitor.

9.3 Design Change Reports

Design and Specification changes may be required during construction. In such cases, procedures outlined in Section 3 shall be followed. Documentation of design changes shall be included in the Final Report.

9.4 Construction Difficulty Reports

In the event that the Contractor has extreme difficulty in the performance of any specified activities required, a special report shall be prepared to address the issue(s). The County, the Contractor, CQA Monitor, and CQA Officer and Engineer shall meet to discuss construction difficulties encountered for the purpose of arriving at a solution. If, at the sole determination by the County (with concurrence by the CQA Consultant), significant changes to the Specifications

are required, the regulatory agency shall be notified (otherwise notification shall be included in the final certification report). Any changes and accompanying approvals shall be in writing.

9.5 Final Report

At the completion of the project, the CQA Consultant shall prepare a final construction documentation report suitable for presentation to the RWQCB and LEA. Copies of all reports and test results prepared by the CQA Monitor shall be submitted to the CQA Officer for review. Copies of all the documents shall be maintained at the CQA Consultant's office. This report shall observe that the work has been performed in compliance with the Construction Drawings and the Specifications. At a minimum this report shall contain:

- A summary of all construction activities
- A summary of all field and laboratory test results
- All logs, forms, and reports
- As-built record drawings, survey point lists
- A description of significant construction issues and the resolution of these issues
- A list of changes (if any) from the Drawings and Specifications and the justification for these changes
- A statement signed and certified by a professional civil engineer or certified engineering geologist registered in the State of California stating that the project was constructed in general accordance with the Drawings and Specifications

9.6 As-Built Drawings

A set of as-built, or record, drawings shall be prepared by the Contractor during the course of construction as required by the Specifications. The as-built drawings shall accurately locate all construction items including the location of piping and the extent of lining and collection system components, etc. This information shall be reviewed for completeness by the CQA Officer and included into the Final Report.

Appendix A

Geoelectrical Leak Location Survey

Geo-Logic ASSOCIATES

APPENDIX A

SECTION 02780

GEOELECTRIC LEAK LOCATION SURVEY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Requirements for the Geoelectric Leak Location Survey Consultant (Leak Location Consultant) for performance of an electronically based liner geoelectric leak survey (leak location survey) for post-construction liner monitoring on the primary HDPE geomembrane prior to placement of geocomposite and operations layer (Water Puddle Method), and after placement of the operations layer (Dipole Method) in Module 9 and 10.

1.2 REFERENCES

A. ASTM International, latest revisions.

1. ASTM D7002-22 Standard Practice for Electrical Leak Location on Exposed Geomembranes Using the Water Puddle System.

2. ASTM D7007-16 Standard Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earth Materials.

3. ASTM D7909-21a Standard Guide for Placement of Intentional Leaks During Electrical Leak Location Surveys of Geomembranes

1.3 SUBMITTALS

A. Prior to commencement of each geoelectric leak location survey, the Leak Location Consultant shall submit a Work Plan. The Leak Location Survey Work Plan shall include:

1. A Statement of Qualifications meeting the requirements of Section 2.1, Paragraph A.

2. Description of the proposed survey method, procedures, site preparations, estimated duration of survey, and quality control and field calibration procedures.

3. A list of number and types of defects located for the qualifying projects of the supervising Leak Location technician that meets or exceeds the requirements of Section 2.1, Paragraph A.

4. A sample final report(s) of the method(s) to be used for this project.

B. If applicable, the Leak Location Consultant shall provide a wire layout and wire specifications for any permanent electrodes to the Contractor 10 days prior to the installation of the geomembrane. The Contractor is responsible for providing the wire.

C. The Leak Location Consultant shall report the general results of the survey to the CQA Monitor during the daily progress of the field work.

D. If functionality testing indicates poor detection sensitivity upon initiating the Leak Location test, the Leak Location Contractor shall notify the CQA Monitor, who shall notify the certifying Engineer, before proceeding with testing.

E. Prior to the demobilization of the survey personnel from the site, the Leak Location Consultant shall submit a list of locations of the leaks detected to the CQA Monitor.

F. The Leak Location Consultant shall submit a letter report documenting the field work and results of the surveys within fourteen (14) days after completion of the field work signed by a Registered Civil Engineer in the state where the work was performed.

PART 2 PRODUCTS

2.1 LEAK LOCATION CONTRACTOR AND SUPERVISOR QUALIFICATIONS

A. The Leak Location Consultant shall have qualifications and experience in conducting electric leak location surveys including having tested a minimum of 5,000,000 square feet of the proposed survey method(s) on at least five projects. In addition, the leak location survey shall be supervised by a professional or technician with a minimum of 2,000,000 square feet of liner testing experience using the proposed method on at least three projects.

PART 3 EXECUTION

3.1 INFORMATION REQUIRED

A. The Leak Location Consultant shall be provided with Drawings showing:

1. All layers constituting the lining system and details of all liner penetrations.

2. Plan of the survey area including locations of measures to provide electrical isolation of the overlying soils.

3. Peripheral details, including welds to adjacent lining systems.

4. Structures and obstructions above the liner.

5. Electrical equipment above the geomembrane.

B. The CQA Monitor shall provide the Leak Location Contractor with a construction and testing schedule.

3.2 WATER PUDDLE LEAK LOCATION SURVEY

A. The water puddle leak detection survey shall be performed after the installation of the primary HDPE geomembrane.

B. The Leak Location Consultant is responsible for calibrating equipment utilized to achieve optimum data quality and sensitivity for the site conditions. This usually involves drilling one or more holes in the geomembrane which the Contractor is responsible for repairing.

C. All testing shall be performed in accordance with current industry and ASTM standards.

D. The survey works best when the geomembrane is in intimate contact with the subgrade. Wrinkles are an impediment to conducting a good survey. Defects on wrinkles may not be detected. Therefore, it is usually in the interest of the project to conduct the survey when the liner system is cool and flat, such as in the morning or during the night.

E. Working on slopes with smooth geomembrane can create safety hazards with slippery surfaces, and may require additional harnessing and slower production rates.

F. Holes shall be logged, visibly marked, and reported for repair.

G. The Leak Location Consultant shall report the general results of the survey to the Lead CQA Monitor during the daily progress of the field work.

H. Prior to the demobilization of the survey personnel from the site, the Leak Location Consultant shall submit a list of locations of the leaks detected to the CQA Monitor and Contractor.

I. The Leak Location Consultant shall submit a letter report documenting the field work and results of the surveys to the CQA Monitor within fourteen (14) days after completion of the field work.

3.3 DIPOLE LEAK LOCATION SURVEY

A. The dipole leak detection survey shall be performed after the placement of the

soil operations layer.

B. The Leak Location Consultant is responsible for calibrating all equipment utilized to achieve optimum data quality and sensitivity for the site conditions.

C. All work shall be performed in accordance with current industry and ASTM standards.

D. Manual measurements shall be made to verify leak signals and to pinpoint the leak positions on top of the soil operations layer for excavation while the survey personnel are on site. Within one foot of the liner, the Contractor's laborers shall hand excavate possible leak locations to expose the liner.

E. Additional manual measurements should be made to guide the Contractor's personnel while they excavate the leak, if required.

F. After the identification and excavation of a leak, the soil around the leak shall be tested while the leak is uncovered and cleaned to check for adjacent leaks.

G. Leak locations shall be logged, visibly marked, and reported for repair.

H. The Leak Location Consultant shall report the general results of the survey to the Lead CQA Monitor and Contractor during the daily progress of the field work.

I. Prior to the demobilization of the survey personnel from the site, the Leak Location Consultant shall submit a list of locations of the leaks detected to the Lead CQA Monitor and Contractor.

J. The Leak Location Consultant shall submit a letter report documenting the field work and results of the surveys to the CQA Monitor within fourteen (14) days after completion of the field work.

END OF SECTION

Appendix B

CQA Field Forms

Geo-Logic ASSOCIATES

Geo-Logic ASSOCIATES

DAILY CONSTRUCTION FIELD REPORT

Project Name:	Project No.	Daily Field Report Sequence Number:	
Location of Work:	Client Or Manager:	Date:	Day of The Week:
General Contractor:	Liner Contractor:	Project Engineer:	
General Foreman:	Liner Superintendent:	Other:	
Source and Description of Fill Material:	Weather:	CQA Technician:	

NOTES (Describe work completed during the day, any problems and their solutions):

.

Prepared By:	Reviewed By:

Geo-Logic ASSOCIATES

MOISTURE - DENSITY SUMMARY

Project Name: _____

Project No.: _____

Test No.	Date	Northing	Easting	Elevation	Sample No	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Source Depth (in)	Density Count	Moisture Count	Wet Density (pcf)	Moisture Content (%)	Dry Density (pcf)	% Comp	P/F	Notes

Geo-Logic
ASSOCIATES

PANEL DEPLOYMENT

Project Name: ________________
Project No.: ________________

Material Type : ________________
[ ] Primary [ ] Secondary [ ] Other

Date	Panel	Roll No.	Length ft	Width ft	Area (sf)	Daily Total (sf)	Cumulative (sf)	Location	Remarks

Geo-Logic ASSOCIATES

PANEL DEPLOYMENT

Project Name: ____________________

Project No.: ____________________

Material Type : ____________________

[ ] Primary [ ] Secondary [ ] Other

Date	Panel	Roll No.	Length ft	Width ft	Area (sf)	Daily Total (sf)	Cumulative (sf)	Location	Remarks

Geo-Logic ASSOCIATES

PANEL DEPLOYMENT

Project Name:
Project No.:

Material Type :
[ ] Primary [ ] Secondary [ ] Other

Date	Panel	Roll No.	Length ft	Width ft	Area (sf)	Daily Total (sf)	Cumulative (sf)	Location	Remarks

Geo-Logic ASSOCIATES

PANEL DEPLOYMENT

Project Name: ______________________

Project No.: ______________________

Material Type : ______________________

[ ] Primary [ ] Secondary [ ] Other

Date	Panel	Roll No.	Length ft	Width ft	Area (sf)	Daily Total (sf)	Cumulative (sf)	Location	Remarks

Geo-Logic
ASSOCIATES

PANEL DEPLOYMENT

Project Name:
Project No.:

Material Type :
[ ] Primary [ ] Secondary [ ] Other

Date	Panel	Roll No.	Length ft	Width ft	Area (sf)	Daily Total (sf)	Cumulative (sf)	Location	Remarks

Geo-Logic
ASSOCIATES

PANEL DEPLOYMENT

Project Name:
Project No.:

Material Type :
[ ] Primary [ ] Secondary [ ] Other

Date	Panel	Roll No.	Length ft	Width ft	Area (sf)	Daily Total (sf)	Cumulative (sf)	Location	Remarks

Geo-Logic
ASSOCIATES

PANEL DEPLOYMENT

Project Name: ____________________

Project No.: ____________________

Material Type : ____________________

[ ] Primary [ ] Secondary [ ] Other

Date	Panel	Roll No.	Length ft	Width ft	Area (sf)	Daily Total (sf)	Cumulative (sf)	Location	Remarks

Geo-Logic
ASSOCIATES

PANEL DEPLOYMENT

Project Name: ____________________
Project No.: ____________________

Material Type : ____________________
[ ] Primary   [ ] Secondary   [ ] Other

Date	Panel	Roll No.	Length ft	Width ft	Area (sf)	Daily Total (sf)	Cumulative (sf)	Location	Remarks

Geo-Logic
ASSOCIATES

PANEL DEPLOYMENT

Project Name:
Project No.:

Material Type :
[ ] Primary [ ] Secondary [ ] Other

Date	Panel	Roll No.	Length ft	Width ft	Area (sf)	Daily Total (sf)	Cumulative (sf)	Location	Remarks

Geo-Logic ASSOCIATES

PANEL DEPLOYMENT

Project Name:
Project No.:

Material Type :
[ ] Primary [ ] Secondary [ ] Other

Date	Panel	Roll No.	Length ft	Width ft	Area (sf)	Daily Total (sf)	Cumulative (sf)	Location	Remarks

Geo-Logic
ASSOCIATES

PANEL DEPLOYMENT

Project Name: ____________________
Project No.: ____________________

Material Type : ____________________
[ ] Primary [ ] Secondary [ ] Other

Date	Panel	Roll No.	Length ft	Width ft	Area (sf)	Daily Total (sf)	Cumulative (sf)	Location	Remarks

Geo-Logic ASSOCIATES

PANEL DEPLOYMENT

Project Name: ______________ Material Type : ______________

Project No.: ______________ [ ] Primary [ ] Secondary [ ] Other

Date	Panel	Roll No.	Length ft	Width ft	Area (sf)	Daily Total (sf)	Cumulative (sf)	Location	Remarks

Geo-Logic ASSOCIATES

PANEL DEPLOYMENT

Project Name: ____________________

Project No.: ____________________

Material Type : ____________________

[ ] Primary [ ] Secondary [ ] Other

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Geo-Logic
ASSOCIATES

PANEL DEPLOYMENT

Project Name: ____________________
Project No.: ____________________

Material Type : ____________________
[ ] Primary [ ] Secondary [ ] Other

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Geo-Logic ASSOCIATES

PANEL DEPLOYMENT

Project Name: ____________________
Project No.: ____________________

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[ ] Primary [ ] Secondary [ ] Other

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Geo-Logic ASSOCIATES

PANEL DEPLOYMENT

Project Name:
Project No.:

Material Type :
[ ] Primary [ ] Secondary [ ] Other

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Geo-Logic
ASSOCIATES

PANEL DEPLOYMENT

Project Name: ____________________

Project No.: ____________________

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[ ] Primary   [ ] Secondary   [ ] Other

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Geo-Logic ASSOCIATES

PANEL DEPLOYMENT

Project Name: ____________________

Project No.: ____________________

Material Type : ____________________

[ ] Primary [ ] Secondary [ ] Other

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Geo-Logic ASSOCIATES

PANEL DEPLOYMENT

Project Name: ____________________

Project No.: ____________________

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[ ] Primary   [ ] Secondary   [ ] Other

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PANEL DEPLOYMENT

Project Name: ____________

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Material Type : ____________

[ ] Primary [ ] Secondary [ ] Other

Date	Panel	Roll No.	Length ft	Width ft	Area (sf)	Daily Total (sf)	Cumulative (sf)	Location	Remarks

Geo-Logic ASSOCIATES

PANEL DEPLOYMENT

Project Name:
Project No.:

Material Type :
[ ] Primary [ ] Secondary [ ] Other

Date	Panel	Roll No.	Length ft	Width ft	Area (sf)	Daily Total (sf)	Cumulative (sf)	Location	Remarks

Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

Project Name:

Project No.:

Note 1: **AT - Air Test**
ST- Spark Test
VT - Vacuum Test

Material Type:

Review By:

[ ] Primary [ ] Secondary [ ] Other

WELDING DATA										TEST DATA							
Weld Date	Seam No.	Seam Length (ft)	Cum. Length (ft)	Time (24hr)	Operator Name	Machine No.	Machine Temp.	Machine Speed	Amb. Temp	Test Date	Test Type	Pressure (psi)	Time (min)	Results P/F	QC Tech	CQA Monitor	Remarks

Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

Project Name:

Project No.:

Note 1: **AT - Air Test**
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VT - Vacuum Test

Material Type:

Review By:

[ ] Primary [ ] Secondary [ ] Other

WELDING DATA										TEST DATA							
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Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

Project Name:

Project No.:

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Material Type:

Review By:

[ ] Primary [ ] Secondary [ ] Other

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Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

Project Name:

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SEAMING AND TESTING LOG

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Project No.: ____________________

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[ ] Primary [ ] Secondary [ ] Other

WELDING DATA										TEST DATA							
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SEAMING AND TESTING LOG

Project Name: ______________________

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Note 1: **AT - Air Test**
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[ ] Primary [ ] Secondary [ ] Other

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Weld Date	Seam No.	Seam Length (ft)	Cum. Length (ft)	Time (24hr)	Operator Name	Machine No.	Machine Temp.	Machine Speed	Amb. Temp	Test Date	Test Type	Pressure (psi)	Time (min)	Results P/F	QC Tech	CQA Monitor	Remarks

Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

Project Name:

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Note 1: **AT - Air Test**
ST- Spark Test
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Material Type:

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[ ] Primary [ ] Secondary [ ] Other

WELDING DATA										TEST DATA							
Weld Date	Seam No.	Seam Length (ft)	Cum. Length (ft)	Time (24hr)	Operator Name	Machine			Amb. Temp	Test Date	Test Type	Pressure (psi)	Time (min)	Results P/F	QC Tech	CQA Monitor	Remarks
						No.	Temp.	Speed									

Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

Project Name: ______________________

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Review By: ______________________

[ ] Primary [ ] Secondary [ ] Other

WELDING DATA										TEST DATA							
Weld	Seam	Seam	Cum.	Time	Operator	Machine			Amb.	Test	Test	Pressure	Time	Results	QC	CQA	Remarks
Date	No.	Length (ft)	Length (ft)	(24hr)	Name	No.	Temp.	Speed	Temp	Date	Type	(psi)	(min)	P/F	Tech	Monitor	

SEAMING AND TESTING LOG

Project Name: ____________________

Project No.: ____________________

Note 1: **AT - Air Test**
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WELDING DATA										TEST DATA							
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Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

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						No.	Temp.	Speed									

SEAMING AND TESTING LOG

Project Name: ____________________

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Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

Project Name:

Project No.:

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ST- Spark Test
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Material Type:

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						No.	Temp.	Speed									

SEAMING AND TESTING LOG

Project Name: ______________________

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Material Type: ______________________

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						No.	Temp.	Speed									

Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

Project Name: ______________________

Project No.: ______________________

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ST- Spark Test
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Material Type: ______________________

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[ ] Primary [ ] Secondary [ ] Other

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Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

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Project No.:

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[ ] Primary [ ] Secondary [ ] Other

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Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

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Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

Project Name: ____________________

Project No.: ____________________

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Material Type: ____________________

Review By: ____________________

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WELDING DATA										TEST DATA							
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						No.	Temp.	Speed									

Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

Project Name: ______________________

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Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

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Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

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Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

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Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

Project Name: ____________________

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Review By: ____________________

[ ] Primary [ ] Secondary [ ] Other

WELDING DATA										TEST DATA							
Weld	Seam	Seam	Cum.	Time	Operator	Machine			Amb.	Test	Test	Pressure	Time	Results	QC	CQA	Remarks
Date	No.	Length (ft)	Length (ft)	(24hr)	Name	No.	Temp.	Speed	Temp	Date	Type	(psi)	(min)	P/F	Tech	Monitor	

Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

Project Name: ____________________

Project No.: ____________________

Note 1: **AT - Air Test**
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Geo-Logic ASSOCIATES

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Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

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Project No.: ______________________

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Review By: ______________________

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SEAMING AND TESTING LOG

Project Name: ______________________

Project No.: ______________________

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Review By: ______________________

[ ] Primary [ ] Secondary [ ] Other

WELDING DATA										TEST DATA							
Weld Date	Seam No.	Seam Length (ft)	Cum. Length (ft)	Time (24hr)	Operator Name	Machine No.	Machine Temp.	Machine Speed	Amb. Temp	Test Date	Test Type	Pressure (psi)	Time (min)	Results P/F	QC Tech	CQA Monitor	Remarks

Geo-Logic ASSOCIATES

SEAMING AND TESTING LOG

Project Name:

Project No.:

Note 1: **AT - Air Test**
ST- Spark Test
VT - Vacuum Test

Material Type:

Review By:

[ ] Primary [ ] Secondary [ ] Other

WELDING DATA										TEST DATA							
Weld Date	Seam No.	Seam Length (ft)	Cum. Length (ft)	Time (24hr)	Operator Name	Machine No.	Machine Temp.	Machine Speed	Amb. Temp	Test Date	Test Type	Pressure (psi)	Time (min)	Results P/F	QC Tech	CQA Monitor	Remarks

Geo-Logic ASSOCIATES

REPAIR LOG

Project Name: _____ **Material Type:** _____

Project No.: _____ **Review By:** _____

[ ] Primary [ ] Secondary [ ] Other

*VT - VACUUM TEST SP - SPARK TEST AT - AIR TEST

Repair #	Seam/ Panel	Location	Description	REPAIR			TEST				
				Date	Equip #	Operator	Date	Type*	Pass Fail	QC Tech	CQA Monitor

Geo-Logic ASSOCIATES

REPAIR LOG

Project Name: ______________________ **Material Type:** ______________________

Project No.: ______________________ **Review By:** ______________________

[ ] Primary [ ] Secondary [ ] Other

*VT - VACUUM TEST SP - SPARK TEST AT - AIR TEST

Repair #	Seam/ Panel	Location	Description	REPAIR Date	REPAIR Equip #	REPAIR Operator	TEST Date	TEST Type*	TEST Pass Fail	TEST QC Tech	TEST CQA Monitor

Geo-Logic ASSOCIATES

REPAIR LOG

Project Name: _____ **Material Type:** _____

Project No.: _____ **Review By:** _____

[ ] Primary [ ] Secondary [ ] Other

*VT - VACUUM TEST SP - SPARK TEST AT - AIR TEST

Repair #	Seam/ Panel	Location	Description	REPAIR			TEST				
				Date	Equip #	Operator	Date	Type*	Pass Fail	QC Tech	CQA Monitor

Geo-Logic ASSOCIATES

REPAIR LOG

Project Name: _____ **Material Type:** _____

Project No.: _____ **Review By:** _____

[ ] Primary [ ] Secondary [ ] Other

*VT - VACUUM TEST SP - SPARK TEST AT - AIR TEST

Repair #	Seam/ Panel	Location	Description	REPAIR			TEST				
				Date	Equip #	Operator	Date	Type*	Pass Fail	QC Tech	CQA Monitor

Geo-Logic ASSOCIATES

REPAIR LOG

Project Name: ______________________ **Material Type:** ______________________

Project No.: ______________________ **Review By:** ______________________

[ ] Primary [ ] Secondary [ ] Other

*VT - VACUUM TEST SP - SPARK TEST AT - AIR TEST

				REPAIR			TEST				
Repair #	Seam/ Panel	Location	Description	Date	Equip #	Operator	Date	Type*	Pass Fail	QC Tech	CQA Monitor

Geo-Logic ASSOCIATES

REPAIR LOG

Project Name: _____ **Material Type:** _____

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*VT - VACUUM TEST SP - SPARK TEST AT - AIR TEST

Repair #	Seam/ Panel	Location	Description	REPAIR			TEST				
				Date	Equip #	Operator	Date	Type*	Pass Fail	QC Tech	CQA Monitor

Geo-Logic ASSOCIATES

REPAIR LOG

Project Name: _____ **Material Type:** _____

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[ ] Primary [ ] Secondary [ ] Other

*VT - VACUUM TEST SP - SPARK TEST AT - AIR TEST

Repair #	Seam/ Panel	Location	Description	REPAIR			TEST				
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REPAIR LOG

Project Name: _____ **Material Type:** _____

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*VT - VACUUM TEST SP - SPARK TEST AT - AIR TEST

Repair #	Seam/ Panel	Location	Description	REPAIR			TEST				
				Date	Equip #	Operator	Date	Type*	Pass Fail	QC Tech	CQA Monitor

Geo-Logic ASSOCIATES

REPAIR LOG

Project Name: _____ **Material Type:** _____

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*VT - VACUUM TEST SP - SPARK TEST AT - AIR TEST

Repair #	Seam/ Panel	Location	Description	REPAIR			TEST				
				Date	Equip #	Operator	Date	Type*	Pass Fail	QC Tech	CQA Monitor

Geo-Logic ASSOCIATES

REPAIR LOG

Project Name: _____ **Material Type:** _____

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[ ] Primary [ ] Secondary [ ] Other

*VT - VACUUM TEST SP - SPARK TEST AT - AIR TEST

Repair #	Seam/ Panel	Location	Description	REPAIR			TEST				
				Date	Equip #	Operator	Date	Type*	Pass Fail	QC Tech	CQA Monitor

REPAIR LOG

Project Name:

Project No.:

Material Type:

Review By:

[ ] Primary [ ] Secondary [ ] Other

*VT - VACUUM TEST SP - SPARK TEST AT - AIR TEST

Repair #	Seam/ Panel	Location	Description	REPAIR Date	REPAIR Equip #	REPAIR Operator	TEST Date	TEST Type*	TEST Pass Fail	TEST QC Tech	TEST CQA Monitor

Geo-Logic ASSOCIATES

REPAIR LOG

Project Name: ____________________

Project No.: ____________________

Material Type: ____________________

Review By: ____________________

[ ] Primary [ ] Secondary [ ] Other

*VT - VACUUM TEST SP - SPARK TEST AT - AIR TEST

Repair #	Seam/ Panel	Location	Description	REPAIR			TEST				
				Date	Equip #	Operator	Date	Type*	Pass Fail	QC Tech	CQA Monitor

Geo-Logic ASSOCIATES

REPAIR LOG

Project Name: ____________________
Project No.: ____________________

Material Type: ____________________
Review By: ____________________
[ ] Primary [ ] Secondary [ ] Other

*VT - VACUUM TEST SP - SPARK TEST AT - AIR TEST

Repair #	Seam/ Panel	Location	Description	REPAIR			TEST				
				Date	Equip #	Operator	Date	Type*	Pass Fail	QC Tech	CQA Monitor

Geo-Logic ASSOCIATES

REPAIR LOG

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Repair #	Seam/ Panel	Location	Description	REPAIR			TEST				
				Date	Equip #	Operator	Date	Type*	Pass Fail	QC Tech	CQA Monitor

Geo-Logic ASSOCIATES

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REPAIR LOG

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Repair #	Seam/ Panel	Location	Description	REPAIR			TEST				
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Geo-Logic ASSOCIATES

REPAIR LOG

Project Name:

Project No.:

Material Type:

Review By:

[ ] Primary   [ ] Secondary   [ ] Other

*VT - VACUUM TEST   SP - SPARK TEST   AT - AIR TEST

Repair #	Seam/ Panel	Location	Description	REPAIR			TEST				
				Date	Equip #	Operator	Date	Type*	Pass Fail	QC Tech	CQA Monitor

Geo-Logic ASSOCIATES

REPAIR LOG

Project Name:

Project No.:

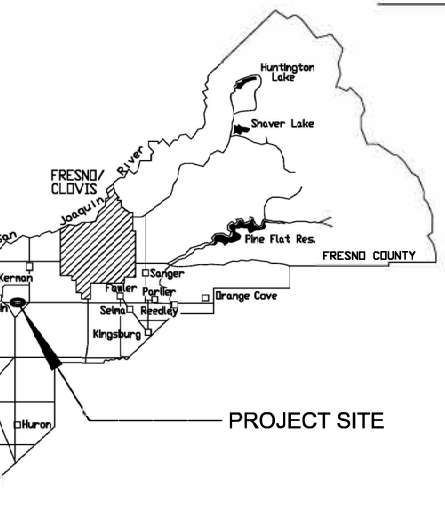
Material Type:

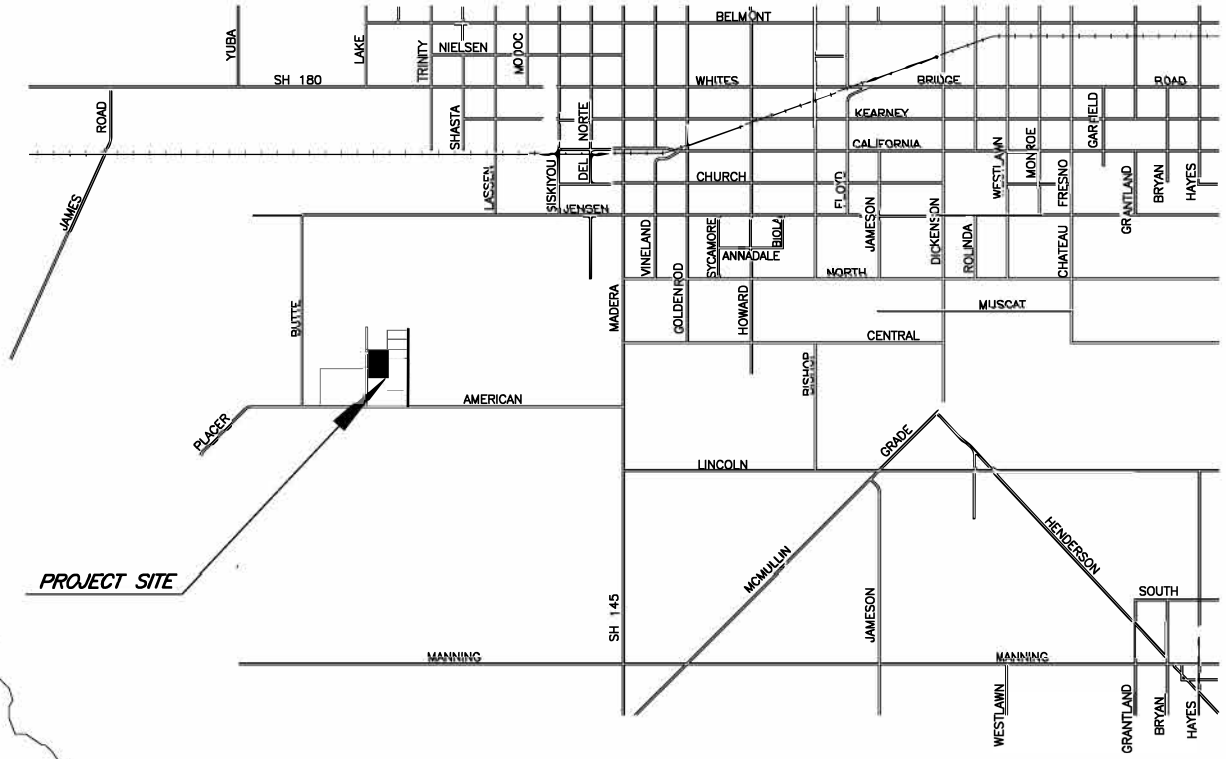
Review By:

[ ] Primary [ ] Secondary [ ] Other

*VT - VACUUM TEST SP - SPARK TEST AT - AIR TEST

Repair #	Seam/ Panel	Location	Description	REPAIR			TEST				
				Date	Equip #	Operator	Date	Type*	Pass Fail	QC Tech	CQA Monitor





GRAPHIC SCALE

(IN MILES)

DESIGNED

DRAWN

CHECKED

DATE

AMERICAN AVENUE DISPOSAL SITE

THE COUNTY OF FRESNO 1856

DEPARTMENT OF PUBLIC WORKS AND PLANNING

LOCATION MAP

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

JUN 29 2016

Mr. Curtis Larkin
American Ave Landfill
Public Works & Planning, Fresno County
2220 Tulare St, 6th Floor
Fresno, CA 93721

Re: Notice of Final Action - Title V Permit Renewal
District Facility # C-3115
Project # C-1150035

Dear Mr. Larkin:

The District has issued the Final Renewed Title V Permit for American Ave Landfill. The preliminary decision for this project was made on April 18, 2016. No comments were received subsequent to the District preliminary decision.

The public notice for issuance of the Final Title V Permit will be published approximately three days from the date of this letter.

Thank you for your cooperation in this matter. If you have any questions, please contact Mr. Errol Villegas, Permit Services Manager, at (559) 230-5900.

Sincerely,

fw Arnaud Marjollet
Director of Permit Services

Enclosures

cc: Tung Le, CARB (w/enclosure) via email
cc: Gerardo C. Rios, EPA (w/enclosure) via email

Seyed Sadredin
Executive Director/Air Pollution Control Officer

Northern Region
4800 Enterprise Way
Modesto, CA 95356-8718
Tel: (209) 557-6400 FAX: (209) 557-6475

Central Region (Main Office)
1990 E. Gettysburg Avenue
Fresno, CA 93726-0244
Tel: (559) 230-6000 FAX: (559) 230-6061

Southern Region
34946 Flyover Court
Bakersfield, CA 93308-9725
Tel: 661-392-5500 FAX: 661-392-5585

www.valleyair.org www.healthyairliving.com

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

Facility # C-3115
AMERICAN AVENUE LANDFILL
2220 TULARE ST, 6TH FLOOR
ATTN: RESOURCES MANAGER
FRESNO, CA 93721

Notice of Permit Issuance

The enclosed permit unit requirements authorize the operation of the equipment as described. These permit unit requirements supersede any and all previous permits for the specified equipment.* Please insert these documents into the Facility Permit to Operate, and post copies on or near the equipment as required by District Rule 2010.

Please contact any of our Small Business Assistance (SBA) staff at the numbers below if you have any questions:

Modesto:	(209) 557-6446
Fresno:	(559) 230-5888
Bakersfield:	(661) 392-5665

*Failure to comply with the permit unit requirements may result in enforcement action.

Seyed Sadredin
Executive Director/Air Pollution Control Officer

Northern Region
4800 Enterprise Way
Modesto, CA 95356-8718
Tel: (209) 557-6400 FAX: (209) 557-6475

Central Region (Main Office)
1990 E. Gettysburg Avenue
Fresno, CA 93726-0244
Tel: (559) 230-6000 FAX: (559) 230-6061

Southern Region
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www.valleyair.org www.healthyairliving.com

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

Permit to Operate

FACILITY: C-3115 **EXPIRATION DATE:** 07/31/2021

LEGAL OWNER OR OPERATOR: AMERICAN AVENUE LANDFILL
MAILING ADDRESS: 2220 TULARE ST, 6TH FLOOR
ATTN: RESOURCES MANAGER
FRESNO, CA 93721

FACILITY LOCATION: 18950 W AMERICAN AVE
KERMAN, CA

FACILITY DESCRIPTION: LANDFILL (EG SOURCE)

The Facility's Permit to Operate may include Facility-wide Requirements as well as requirements that apply to specific permit units.

This Permit to Operate remains valid through the permit expiration date listed above, subject to payment of annual permit fees and compliance with permit conditions and all applicable local, state, and federal regulations. This permit is valid only at the location specified above, and becomes void upon any transfer of ownership or location. Any modification of the equipment or operation, as defined in District Rule 2201, will require prior District approval. This permit shall be posted as prescribed in District Rule 2010.

Seyed Sadredin
Executive Director / APCO

Arnaud Marjollet
Director of Permit Services

Central Regional Office • 1990 E. Gettysburg Ave. • Fresno, CA 93726 • (559) 230-5900 • Fax (559) 230-6061

San Joaquin Valley
Air Pollution Control District

FACILITY: C-3115-0-3 **EXPIRATION DATE:** 07/31/2021

FACILITY-WIDE REQUIREMENTS

1. The owner or operator shall notify the District of any breakdown condition as soon as reasonably possible, but no later than one hour after its detection, unless the owner or operator demonstrates to the District's satisfaction that the longer reporting period was necessary. [District Rule 1100] Federally Enforceable Through Title V Permit
2. The District shall be notified in writing within ten days following the correction of any breakdown condition.. The breakdown notification shall include a description of the equipment malfunction or failure, the date and cause of the initial failure, the estimated emissions in excess of those allowed, and the methods utilized to restore normal operations. [District Rule 1100] Federally Enforceable Through Title V Permit
3. The owner or operator of any stationary source operation that emits more than 25 tons per year of nitrogen oxides or reactive organic compounds, shall provide the District annually with a written statement in such form and at such time as the District prescribes, showing actual emissions of nitrogen oxides and reactive organic compounds from that source. [District Rule 1160] Federally Enforceable Through Title V Permit
4. Any person building, altering or replacing any operation, article, machine, equipment, or other contrivance, the use of which may cause the issuance of air contaminants or the use of which may eliminate, reduce, or control the issuance of air contaminants, shall first obtain an Authority to Construct (ATC) from the District unless exempted by District Rule 2020 (12/20/07). [District Rules 2010 and 2020] Federally Enforceable Through Title V Permit
5. The permittee must comply with all conditions of the permit including permit revisions originated by the District. All terms and conditions of a permit that are required pursuant to the Clean Air Act (CAA), including provisions to limit potential to emit, are enforceable by the EPA and Citizens under the CAA. Any permit noncompliance constitutes a violation of the CAA and the District Rules and Regulations, and is grounds for enforcement action, for permit termination, revocation, reopening and reissuance, or modification; or for denial of a permit renewal application. [District Rules 2070, 2080 and 2520] Federally Enforceable Through Title V Permit
6. A Permit to Operate or an Authority to Construct shall not be transferred unless a new application is filed with and approved by the District. [District Rule 2031] Federally Enforceable Through Title V Permit
7. Every application for a permit required under Rule 2010 (12/17/92) (Permits Required) shall be filed in a manner and form prescribed by the District. [District Rule 2040] Federally Enforceable Through Title V Permit
8. The operator shall maintain records of required monitoring that include: 1) the date, place, and time of sampling or measurement; 2) the date(s) analyses were performed; 3) the company or entity that performed the analysis; 4) the analytical techniques or methods used; 5) the results of such analysis; and 6) the operating conditions at the time of sampling or measurement. [District Rule 2520] Federally Enforceable Through Title V Permit
9. The operator shall retain records of all required monitoring data and support information for a period of at least 5 years from the date of the monitoring sample, measurement, or report. Support information includes copies of all reports required by the permit and, for continuous monitoring instrumentation, all calibration and maintenance records and all original strip-chart recordings. [District Rule 2520] Federally Enforceable Through Title V Permit
10. The operator shall submit reports of any required monitoring at least every six months unless a different frequency is required by an applicable requirement. All instances of deviations from permit requirements must be clearly identified in such reports. [District Rule 2520] Federally Enforceable Through Title V Permit

FACILITY-WIDE REQUIREMENTS CONTINUE ON NEXT PAGE

11. Deviations from permit conditions must be promptly reported, including deviations attributable to upset conditions, as defined in the permit. For the purpose of this condition, promptly means as soon as reasonably possible, but no later than 10 days after detection. The report shall include the probable cause of such deviations, and any corrective actions or preventive measures taken. All required reports must be certified by a responsible official consistent with section 10.0 of District Rule 2520(6/21/01). [District Rules 2520 and 1100] Federally Enforceable Through Title V Permit
12. If for any reason a permit requirement or condition is being challenged for its constitutionality or validity by a court of competent jurisdiction, the outcome of such challenge shall not affect or invalidate the remainder of the conditions or requirements in that permit. [District Rule 2520] Federally Enforceable Through Title V Permit
13. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of the permit. [District Rule 2520] Federally Enforceable Through Title V Permit
14. The permit may be modified, revoked, reopened and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition. [District Rule 2520] Federally Enforceable Through Title V Permit
15. The permit does not convey any property rights of any sort, or any exclusive privilege. [District Rule 2520] Federally Enforceable Through Title V Permit
16. The Permittee shall furnish to the District, within a reasonable time, any information that the District may request in writing to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit or to determine compliance with the permit. Upon request, the permittee shall also furnish to the District copies of records required to be kept by the permit or, for information claimed to be confidential, the permittee may furnish such records directly to EPA along with a claim of confidentiality. [District Rule 2520] Federally Enforceable Through Title V Permit
17. The permittee shall pay annual permit fees and other applicable fees as prescribed in Regulation III of the District Rules and Regulations. [District Rule 2520] Federally Enforceable Through Title V Permit
18. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 2520] Federally Enforceable Through Title V Permit
19. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 2520] Federally Enforceable Through Title V Permit
20. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to inspect at reasonable times any facilities, equipment, practices, or operations regulated or required under the permit. [District Rule 2520] Federally Enforceable Through Title V Permit
21. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to sample or monitor, at reasonable times, substances or parameters for the purpose of assuring compliance with the permit or applicable requirements. [District Rule 2520] Federally Enforceable Through Title V Permit
22. No air contaminants shall be discharged into the atmosphere from any source operation (as defined in District Rule 1020) for a period or periods aggregating more than 3 minutes in any one hour which is as dark or darker than Ringelmann #1 or equivalent to 20% opacity and greater, unless specifically exempted by District Rule 4101 (2/17/05), by using EPA method 9. If the equipment or operation is subject to a more stringent visible emission standard as prescribed in a permit condition, the more stringent visible emission limit shall supersede this condition. [District Rule 4101] Federally Enforceable Through Title V Permit

FACILITY-WIDE REQUIREMENTS CONTINUE ON NEXT PAGE

23. No person shall supply, sell, solicit or apply any architectural coating, except specialty coatings, that contains more than 250 grams of VOC per liter of coating (less water and exempt compounds, and excluding any colorant added to tint bases), or manufacture, blend, or repackage such coating with more than 250 grams of VOC per liter (less water and exempt compounds, and excluding any colorant added to tint bases) for use within the District, unless exempted under section 4.0 of District Rule 4601 (Amended 12/17/09). [District Rule 4601] Federally Enforceable Through Title V Permit

24. No person shall apply, sell, solicit, or offer for sale any specialty architectural coating listed in the Table of Standards (District Rule 4601, Table 1 (12/17/09)), nor manufacture, blend, or repackage such coating for use within the District, which contains VOCs (less water and exempt compounds, excluding any colorant added to tint bases) in excess of the specified limits listed in Table 1 of Rule 4601 (12/17/09), unless exempted under section 4.0 of District Rule 4601 (Amended 12/17/09). [District Rule 4601] Federally Enforceable Through Title V Permit

25. All VOC-containing materials shall be stored in closed containers when not in use. In use includes, but is not limited to: being accessed, filled, emptied, maintained or repaired, unless exempted under section 4.0 of District Rule 4601 (Amended 12/17/09). [District Rule 4601] Federally Enforceable Through Title V Permit

26. A person shall not use VOCs for the cleanup of spray equipment unless equipment for collection of the cleaning compounds and minimizing its evaporation to the atmosphere is used, unless exempted under section 4.0 of District Rule 4601 (Amended 12/17/09). [District Rule 4601] Federally Enforceable Through Title V Permit

27. The permittee shall comply with all the Labeling and Test Methods requirements outlined in Rule 4601 sections 6.1 and 6.2 (12/17/09), unless exempted under section 4.0 of District Rule 4601 (Amended 12/17/09). [District Rule 4601] Federally Enforceable Through Title V Permit

28. With each report or document submitted under a permit requirement or a request for information by the District or EPA, the permittee shall include a certification of truth, accuracy, and completeness by a responsible official. [District Rule 2520] Federally Enforceable Through Title V Permit

29. If the permittee performs maintenance on, or services, repairs, or disposes of appliances, the permittee shall comply with the standards for Recycling and Emissions Reduction pursuant to 40 CFR Part 82, Subpart F. [40 CFR 82 Subpart F] Federally Enforceable Through Title V Permit

30. If the permittee performs service on motor vehicles when this service involves the ozone-depleting refrigerant in the motor vehicle air conditioner (MVAC), the permittee shall comply with the standards for Servicing of Motor Vehicle Air Conditioners pursuant to all the applicable requirements as specified in 40 CFR Part 82, Subpart B. [40 CFR Part 82, Subpart B] Federally Enforceable Through Title V Permit

31. Disturbances of soil related to any construction, demolition, excavation, extraction, or other earthmoving activities shall comply with the requirements for fugitive dust control in District Rule 8021 unless specifically exempted under Section 4.0 of Rule 8021 (8/19/04) or Rule 8011 (8/19/04). [District Rule 8021 and 8011] Federally Enforceable Through Title V Permit

32. Outdoor handling, storage and transport of any bulk material which emits dust shall comply with the requirements of District Rule 8031, unless specifically exempted under Section 4.0 of Rule 8031 (8/19/04) or Rule 8011 (8/19/04). [District Rule 8031 and 8011] Federally Enforceable Through Title V Permit

33. An owner/operator shall prevent or cleanup any carryout or trackout in accordance with the requirements of District Rule 8041 Section 5.0, unless specifically exempted under Section 4.0 of Rule 8041 (8/19/04) or Rule 8011 (8/19/04). [District Rule 8041 and 8011] Federally Enforceable Through Title V Permit

34. Whenever open areas are disturbed or vehicles are used in open areas, the facility shall comply with the requirements of Section 5.0 of District Rule 8051, unless specifically exempted under Section 4.0 of Rule 8051 (8/19/04) or Rule 8011 (8/19/04) [District Rule 8051 and 8011] Federally Enforceable Through Title V Permit

35. Any paved road or unpaved road shall comply with the requirements of District Rule 8061 unless specifically exempted under Section 4.0 of Rule 8061 (8/19/04) or Rule 8011 (8/19/04). [District Rule 8061 and 8011] Federally Enforceable Through Title V Permit

FACILITY-WIDE REQUIREMENTS CONTINUE ON NEXT PAGE

36. Any unpaved vehicle/equipment area that anticipates more than 75 vehicle trips per day shall comply with the requirements of Section 5.1.1 of District Rule 8071. Any unpaved vehicle/equipment area that anticipates more than 100 vehicle trips per day shall comply with the requirements of Section 5.1.2 of District Rule 8071. All sources shall comply with the requirements of Section 5.0 of District Rule 8071 unless specifically exempted under Section 4.0 of Rule 8071 (9/16/04) or Rule 8011 (8/19/04). [District Rule 8071 and 8011] Federally Enforceable Through Title V Permit

37. Any owner or operator of a demolition or renovation activity, as defined in 40 CFR 61.141, shall comply with the applicable inspection, notification, removal, and disposal procedures for asbestos containing materials as specified in 40 CFR 61.145 (Standard for Demolition and Renovation). [40 CFR 61 Subpart M] Federally Enforceable Through Title V Permit

38. The permittee shall submit certifications of compliance with the terms and standards contained in Title V permits, including emission limits, standards and work practices, to the District and the EPA annually (or more frequently as specified in an applicable requirement or as specified by the District). The certification shall include the identification of each permit term or condition, the compliance status, whether compliance was continuous or intermittent, the methods used for determining the compliance status, and any other facts required by the District to determine the compliance status of the source. [District Rule 2520] Federally Enforceable Through Title V Permit

39. Any Title V permittee shall submit an application permit renewal to the District at least six months, but not greater than 18 months, prior to the Title V permit expiration date. [District Rule 2520] Federally Enforceable Through Title V Permit

40. When a term is not defined in a Title V permit condition, the definition in the rule cited as the origin and authority for the condition in a Title V permit shall apply. [District Rule 2520] Federally Enforceable Through Title V Permit

41. The reporting periods for the Report of Required Monitoring and the Compliance Certification Report begin July 1 of every year, unless alternative dates are approved by the District Compliance Division. These reports are due within 30 days after the end of the reporting period. [District Rule 2520] Federally Enforceable Through Title V Permit

42. No air contaminant shall be released into the atmosphere which causes a public nuisance. [District Rule 4102]

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: C-3115-2-14 **EXPIRATION DATE:** 07/31/2021

EQUIPMENT DESCRIPTION:
44.4 MILLION CUBIC YARD CAPACITY (367 ACRES) MUNICIPAL SOLID WASTE LANDFILL WITH A LANDFILL GAS COLLECTION AND CONTROL SYSTEM, INCLUDING COLLECTION WELLS, PIPING, VACUUM PUMP/BLOWER, CONDENSATE TRAPS AND A 3,150 GALLON CONDENSATE STORAGE TANK, CONTROLLED BY ONE 51 MMBTU/HR AND ONE 99 MMBTU/HR ENCLOSED GROUND FLARE USING AN LPG PILOT

PERMIT UNIT REQUIREMENTS

1. Annual amount of soil used for covering shall not exceed 5,920,933 cubic yards of soil, and PM10 emissions shall not exceed 0.008 lb PM10/ton of soil (using a soil density of 3,240 lbs/cubic yard of soil). Permittee shall keep annual records of the amount of soil used for covering. [District Rule 2201] Federally Enforceable Through Title V Permit
2. All equipment shall be maintained in good operating condition and shall be operated in a manner to minimize emissions of air contaminants into the atmosphere. [District Rule 2201 and 40 CFR Part 60.752(b)(2)(iii)(B)(2) and (b)(2)(iv), and 62.14353(b)] Federally Enforceable Through Title V Permit
3. All equipment shall be constructed, calibrated, maintained and operated according to the specifications and plans contained in the permit application except as otherwise specified herein. [District Rule 2201 and 40 CFR 60.755(d), 60.756(b), 62.14354(b) and 40 CFR part 64] Federally Enforceable Through Title V Permit
4. No air contaminant shall be discharged from the flare into the atmosphere for a period or periods aggregating more than five minutes in any two hours which is as dark as, or darker than, Ringelmann 1/4 or 5% opacity. [40 CFR 60.18(c)(1)] Federally Enforceable Through Title V Permit
5. Particulate matter emissions from any combustion source shall not exceed 0.1 grains/dscf (calculated to 12% carbon dioxide). [District Rule 4301] Federally Enforceable Through Title V Permit
6. Landfill gas condensate can be injected into the enclosed flares. [District Rule 2201] Federally Enforceable Through Title V Permit
7. The enclosed flares shall be equipped with automatic dampers, an automatic shutdown device, and a flame arrester. [District Rule 2201 and 17 CCR 95464] Federally Enforceable Through Title V Permit
8. VOC emissions from this landfill operation controlled with the 51 MMBtu/hr and 99 MMBtu/hr enclosed flares shall not exceed 804.3 lb/day (includes landfill fugitive, flare landfill gas, flare pilot, and flare condensate emissions). [District Rule 2201] Federally Enforceable Through Title V Permit
9. The enclosed flares shall either reduce VOC by 98 weight percent or reduce the outlet VOC concentration to less than 20 parts per million by volume, dry basis as methane at 3 percent oxygen. [District Rules 2201 and 4102, and 40 CFR 60.752(b)(2)(iii)(B) and 62.14353(b)] Federally Enforceable Through Title V Permit
10. The methane destruction efficiency for the enclosed flares shall be at least 99% by weight. [17 CCR 95464]
11. The landfill gas consumption rate for the 51 MMBtu/hr enclosed flare shall not exceed 51 MMBtu/hr. Heat input shall be calculated daily using landfill gas flow into the flare (cubic feet per minute) and the annually tested landfill gas heat content (Btu/cubic foot). [District Rule 2201] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

12. The landfill gas consumption rate for the 99 MMBtu/hr enclosed flare shall not exceed 99 MMBtu/hr. Heat input shall be calculated daily using landfill gas flow into the flare (cubic feet per minute) and the annually tested landfill gas heat content (Btu/cubic foot). [District Rule 2201] Federally Enforceable Through Title V Permit
13. Emissions from the 51 MMBtu/hr enclosed flare shall not exceed any of the following limits: 0.05 lb-NOx/MMBtu; 0.0178 lb-SOx/MMBtu (46.9 ppmv of H2S in fuel); 0.2 lb-CO/MMBtu; or 0.008 lb-PM10/MMBtu. [District Rule 2201] Federally Enforceable Through Title V Permit
14. Emissions from the 99 MMBtu/hr enclosed flare shall not exceed any of the following limits: 0.057 lb-NOx/MMBtu; 0.0178 lb-SOx/MMBtu (46.9 ppmv of H2S in fuel); 0.110 lb-CO/MMBtu; or 0.008 lb-PM10/MMBtu. [District Rule 2201] Federally Enforceable Through Title V Permit
15. Landfill design capacity shall not exceed 44.4 million cubic yards, or 367 acres, of solid waste. Annual amount of refuse received shall not exceed 1,300,000 ton/year. [District Rule 2201] Federally Enforceable Through Title V Permit
16. The enclosed flares shall be equipped with an LPG fired pilot. [40 CFR 60.18(c)(2) and (f)(2)] Federally Enforceable Through Title V Permit
17. Emissions from the flare LPG-fired pilot shall not exceed any of the following limits: 0.15 lb-NOx/MMBtu, 0.0164 lb-SOx/MMBtu, 0.0044 lb-PM10/MMBtu, 0.021 lb-CO/MMBtu, or 0.0055 lb-VOC/MMBtu. [District Rule 2201] Federally Enforceable Through Title V Permit
18. Source sampling to determine the compliance status of an emissions source shall be witnessed or authorized by District personnel. [District Rule 1081] Federally Enforceable Through Title V Permit
19. The District must be notified 30 days prior to any compliance source test, and a source test plan must be submitted for approval 15 days prior to testing. The results of each source test shall be submitted to the District within 60 days after testing. [District Rule 1081] Federally Enforceable Through Title V Permit
20. Source testing to demonstrate compliance with VOC, NOx, and CO emission limits and VOC control efficiency requirements shall be conducted at least once every 12 months for each flare. [District Rule 2201] Federally Enforceable Through Title V Permit
21. Source testing for NOx shall be conducted using EPA Test Method 7E or CARB Method 100. [District Rule 1081] Federally Enforceable Through Title V Permit
22. Source testing for CO shall be conducted using EPA Test Method 10 or 10B, CARB Methods 1-5 with 10 or CARB Test Method 100. [District Rule 1081] Federally Enforceable Through Title V Permit
23. Gas combusted in the flares shall be tested for H2S content on a quarterly basis using Draeger tubes. If compliance is shown for two consecutive quarters, the testing frequency may be changed to annual. Quarterly testing shall resume if any annual test shows noncompliance. [District Rule 1081] Federally Enforceable Through Title V Permit
24. VOC emissions shall be measured by USEPA Test Method 18, 25, 25A, or 25C. [District Rule 1081 and 40 CFR 60.754(d) and 62.14354(b)] Federally Enforceable Through Title V Permit
25. The enclosed flares shall be equipped with a temperature indicator and recorder which measures and records the operating temperature. The temperature indicator and recorder must operate continuously. [40 CFR 60.756(b)(1) and 62.14354(b)] Federally Enforceable Through Title V Permit
26. The enclosed flare control devices shall be operated within the parameter ranges established during the initial or most recent performance test. [40 CFR 60.752(b)(2)(iii)(B)(2) and 62.14353(b) and 17 CCR 95464] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

27. Except during periods of startup, shutdown, and malfunction, the permittee shall continuously monitor and record combustion chamber temperature. The enclosed flare average combustion temperature, for all 3-hour periods of operation, shall not drop more than 28 degrees C below the average combustion temperature, during the most recent performance test at which compliance with 60.752(b)(2)(iii)(B)(2) was determined. Upon detecting any temperature excursion lower than 28 degree C (50 degree F) below the source test average combustion temperature, averaged over a 3-hour period, the permittee shall investigate the excursion and take corrective action to minimize excessive emissions and prevent recurrence of the excursion as expeditiously as practicable. Duration of startup, shutdown, or malfunction shall not exceed 5 days for collection systems and shall not exceed 1 hour for control devices where free venting of landfill gas occurs. [40 CFR 60.758(c)(1)(i), 60.755(e), 62.14354(b), and 40 CFR part 64] Federally Enforceable Through Title V Permit

28. The owner or operator shall measure the gauge pressure in the gas collection header at each individual interior well on a monthly basis as provided in 60.755(a)(3). If a positive pressure exists, action shall be initiated to correct the exceedance within 5 calendar days. If negative pressure cannot be achieved without excess air infiltration within 15 calendar days of the first measurement, the gas collection system shall be expanded to correct the exceedance within 120 days of the initial measurement of positive pressure. Any attempted corrective measure shall not cause exceedances of other operational or performance standards. An alternative timeline for correcting the exceedance may be submitted to the Administrator for approval. [40 CFR 60.755(a)(3), 60.756(a)(1), and 62.14354(b)] Federally Enforceable Through Title V Permit

29. The owner or operator shall monitor each interior well monthly for temperature and oxygen as provided in 60.753(c). If a well exceeds one of these operating parameters, action shall be initiated to correct the exceedance within 5 calendar days. If correction of the exceedance cannot be achieved within 15 calendar days of the first measurement, the gas collection system shall be expanded to correct the exceedance within 120 days of the initial exceedance. Any attempted corrective measure shall not cause exceedances of other operational or performance standards. An alternative timeline for correcting the exceedance may be submitted to the Administrator for approval. [40 CFR 60.753(c), 60.755(a)(3) and (a)(5), 60.756(a)(2) and (a)(3), and 62.14354(b)] Federally Enforceable Through Title V Permit

30. The operator shall record quarterly the surface emission tests including test time, weather conditions, precipitation records, areas sampled, calibration records, and test results. Corrective action shall be taken if required in accordance to 40 CFR 60.755(c). [District Rule 2201, 40 CFR 60.755(c), 60.756(f), and 62.14354(b)] Federally Enforceable Through Title V Permit

31. Permittee shall maintain continuous records of flare combustion temperature and volumetric gas flow rate. Permittee shall record and test the net heating value of landfill gas being combusted at least annually using ASTM D 1826 or D 1945 in conjunction with ASTM D 3588 for gaseous fuels. [District Rule 2201 and 40 CFR 60.756(b), 60.758(b)(2)(i), (c)(2) and (b)(2)(i), and 62.14354(b)] Federally Enforceable Through Title V Permit

32. Permittee shall keep, for the life of the collection system, an up-to-date, readily accessible plot map showing each existing and planned collector in the system and providing a unique identification location label for each collector. [40 CFR 60.758(d) and 60.34(c)] Federally Enforceable Through Title V Permit

33. The operator shall record emission control device source tests including VOC destruction/treatment efficiency and emissions of CO, NOx, and SOx, in pounds per MMBtu heat input. [District Rule 1081] Federally Enforceable Through Title V Permit

34. Records of the weight of materials received (tons) of Class II/III waste material shall be maintained. [District Rule 2201] Federally Enforceable Through Title V Permit

35. This operating permit may be cancelled upon District approval when the landfill is closed, is not otherwise subject to the requirements of 40 CFR part 70 or part 71, and if the landfill meets the conditions for control system removal specified in 40 CFR 60.752(b)(2)(v). [40 CFR 62.14352(f)] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

36. An active collection system shall be designed to handle the maximum expected gas flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control or treatment system equipment, collect gas from each area, cell, or group of cells in the landfill in which the initial solid waste has been placed for a period of 5 years or more if active; or 2 years or more if closed or at final grade, collect gas at a sufficient extraction rate, and be designed to minimize off-site migration of subsurface gas. [40 CFR 60.752(b)(2)(ii)(A) and 62.14353(b)] Federally Enforceable Through Title V Permit

37. If the landfill is permanently closed, a closure notification shall be submitted to the APCO within 30 days of waste disposal cessation. A permanent closure must take place in accordance with 40 CFR 258.60. If a closure report has been submitted, no additional waste may be placed in the landfill without filing a notification of modification to the APCO, pursuant to 40 CFR 60.7(a)(4). [40 CFR 60.752(b)(1)(ii)(B), 60.757(d), and 62.14354(b)] Federally Enforceable Through Title V Permit

38. For approval of collection and control systems that include any alternatives to the operational standards, test methods, procedures, compliance measures, monitoring, recordkeeping or reporting provisions, owner or operator must follow the procedures in 40 CFR 60.752(b)(2). If alternatives have already been approved under 40 CFR Part 62 subpart GGG, these alternatives can be used to comply with 40 CFR 63 subpart AAAA, except that all affected sources must comply with the startup, shutdown, and malfunction (SSM) requirements in subpart A of 40 CFR 63 as specified in Table 1 of 40 CFR 63 subpart AAAA and all affected sources must submit compliance reports every 6 months as specified in 40 CFR 63.1980(a) and (b), including information on all deviations that occurred during the 6 month reporting period. Deviations for continuous emission monitors or numerical continuous parameter monitors must be determined using a 3 hour monitoring block average. [40 CFR 60.752(b)(2) and 63.1955(c)] Federally Enforceable Through Title V Permit

39. Permittee shall operate the landfill gas collection system with negative pressure at each wellhead except under the following conditions: (1) A fire or increased well temperature. The owner or operator shall record instances when positive pressure occurs in efforts to avoid a fire. These records shall be submitted with the annual reports ass provided in 60.757(f)(1); (2) At a wellhead within the immediate vicinity of filling; (3) Use of a geomembrane or synthetic cover. The owner or operator shall develop acceptable pressure limits in the design plan; (4) A decommissioned well. A well may experience a static positive pressure after shut down to accommodate for declining flows. All design changes shall be approved by the APCO. [40 CFR 60.753(b) and 62.14354(b) and 17 CCR 95464, !& CCR 95468] Federally Enforceable Through Title V Permit

40. Permittee shall operate the collection system so that the methane concentration is less than 500 parts per million above background at the surface of the landfill. To determine if this level is exceeded, the owner or operator shall conduct surface testing around the perimeter of the collection area and along a pattern that traverses the landfill at 30 meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as distressed vegetation and cracks or seeps in the cover. The owner or operator may establish an alternative traversing pattern that ensures equivalent coverage. A surface monitoring design plan shall be developed that includes a topographical map with the monitoring route and the rationale for any site-specific deviations from the 30 meter intervals. Areas with steep slopes or other dangerous areas may be excluded from the surface testing. [40 CFR 60.753(d), 60.755(c)(1) and 62.14354(b)] Federally Enforceable Through Title V Permit

41. Compliance with the surface methane operational standard shall be demonstrated using the procedures outlined in 40 CFR 60.755(c) within 180 days of installation and startup of the collection and control system and quarterly thereafter. [40 CFR 60.753(d), 60.755(c), 62.14354(b), and 60.8] Federally Enforceable Through Title V Permit

42. Permittee shall operate the enclosed flares at all times when the collected gas is routed to it. [40 CFR 60.753(f) and 62.14354(b)] Federally Enforceable Through Title V Permit

43. Permittee shall operate the landfill gas collection system such that gas is collected from each area, cell, or group of cells in the MSW landfill in which solid waste has been in place for: (1) five years or more if active; or (2) two years or more if closed or at final grade. [40 CFR 60.753(a) and 62.14354(b)] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

44. Permittee shall operate each interior wellhead in the collection system with a landfill gas temperature less than 55 C and with oxygen level less than 5 percent except under the following conditions: (1) A fire or increased well temperature; or (2) at a wellhead within the immediate vicinity of filling. The owner or operator may establish a higher operating temperature or oxygen value at a particular well. A higher operating value demonstration shall show supporting data that the elevated parameter does not cause fires or significantly inhibit anaerobic decompositions by killing methanogens. [40 CFR 60.753(c) and 62.14354(b)] Federally Enforceable Through Title V Permit

45. The collection system shall be operated so that the methane concentration is less than 500 parts per million above background at the surface of the landfill, and such that all collected gases are sent to a control system designed and operated in compliance with 60.752(b)(2)(iii). In the event the collection or control system is inoperable, the gas mover system shall be shut down and all valves in the collection and control system contributing to venting of the gas to the atmosphere shall be closed within 1 hour. [40 CFR 60.753(d), (e), 60.755(c), and 62.14354(b)] Federally Enforceable Through Title V Permit

46. If monitoring demonstrates that the operational requirements are not met, corrective action shall be taken as specified in 40 CFR 60.755(a)(3 - 5) or (c). [40 CFR 60.753(g) and 62.14354(b)] Federally Enforceable Through Title V Permit

47. For each interior wellhead, unless an alternative test method is established as allowed by 60.752(b)(2)(i) of this subpart, the oxygen shall be determined by a Landtec GEM gas meter or equal, in accordance with the equipment requirements set forth in 40 CFR 60.753 for field measurement of temperature and oxygen or an oxygen meter using Method 3A or 3C except that: (i) The span shall be set so that the regulatory limit is between 20 and 50 percent of the span; (ii) A data recorder is not required; (iii) Only two calibration gases are required, a zero and span, and ambient air may be used as the span; (iv) A calibration error check is not required; (v) The allowable sample bias, zero drift, and calibration drift are +-10 percent. [40 CFR 60.753(c)(2) and 62.14354(b)] Federally Enforceable Through Title V Permit

48. Surface emission monitoring shall be performed in accordance with section 4.3.1 of Method 21 of appendix A, except that the probe inlet shall be placed within 5 to 10 centimeters of the ground. Monitoring shall be performed during typical meteorological conditions. Any reading of 500 parts per million or more above background at any location shall be recorded as a monitored exceedance and the actions specified in 40 CFR 60.755(c)(4)(i-v) shall be taken. As long as the specified actions are taken, the exceedance is not a violation of the operational requirements of 60.753(d). [40 CFR 60.755(c)(3), (4) and 62.14354(b)] Federally Enforceable Through Title V Permit

49. Permittee shall calculate the NMOC emission rate for purposes of determining when the collection and control system can be removed as provided in 40 CFR 60.752(b)(2)(v) by using the equation found in 40 CFR 60.754(b). [40 CFR 60.754(b) and 62.14354(b)] Federally Enforceable Through Title V Permit

50. For the performance test required in 60.752(b)(2)(iii)(B), Method 25, 25C, or Method 18 of Appendix A must be used to determine compliance with the 98 weight percent efficiency or the 20 ppmv outlet concentration level, unless another method to demonstrate compliance has been approved by the APCO as provided by 60.752(b)(2)(i)(B). Method 3 or 3A shall be used to determine oxygen for correcting the NMOC concentration as hexane to 3 percent. In cases where the outlet concentration is less than 50 ppm NMOC as carbon (8 ppm NMOC as hexane), Method 25A should be used in place of Method 25. If using Method 18 of appendix A, the minimum list of compounds to be tested shall be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42). The following equation shall be used to calculate efficiency: (NMOCin - NMOCout)/NMOCin. The District must be notified at least 30 days prior to any compliance source test, and a source test plan must be submitted for approval at least 15 days prior to testing. [District Rule 1081 and 40 CFR 60.754(d) and 62.14354(b)] Federally Enforceable Through Title V Permit

51. Each owner or operator shall place each well or design component as specified in the approved design plan as provided in 40 CFR 60.752(b)(2)(i). Each well shall be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of: 1) 5 years or more if active or 2) 2 years or more if closed or at final grade. [40 CFR 60.755(b) and 62.14354(b)] Federally Enforceable Through Title V Permit

52. For the purposes of calculating the maximum expected gas generation flow rate from the landfill to determine compliance with 60.752(b)(2)(ii)(A)(1), one of the equations in Section 60.755(a)(1)(i) or (ii) or (iii) shall be used. [40 CFR 60.755(a)(1) and 62.14354(b)] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

53. For the purposes of determining sufficient density of gas collectors for compliance with 60.752(b)(2)(ii)(A)(2), the owner or operator shall design a system of vertical wells, horizontal collectors, or other collection devices, satisfactory to the APCO, capable of controlling and extracting gas from all portions of the landfill sufficient to meet all operational and performance standards. [40 CFR 60.755(a)(2) and 62.14354(b)] Federally Enforceable Through Title V Permit

54. Owners or operators are not required to expand the system as required in paragraph 60.755(a)(3) during the first 180 days after gas collection system startup. [40 CFR 60.755(a)(4) and 62.14354(b)] Federally Enforceable Through Title V Permit

55. The provisions of this subpart apply at all times, except during periods of start-up, shutdown, or malfunction, provided that the duration of start-up, shutdown, or malfunction shall not exceed 5 days for collection systems and shall not exceed 1 hour for treatment or control devices. [40 CFR 60.755(e) and 62.14354(b)] Federally Enforceable Through Title V Permit

56. Surface monitoring shall be performed on a quarterly basis using an organic vapor analyzer, flame ionization detector, or other portable monitor meeting the specifications provided in 40 CFR 60.755(d). [40 CFR 60.755(c)(1) and 62.14354(b)] Federally Enforceable Through Title V Permit

57. When performing surface monitoring, the background concentration shall be determined by moving the probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least 30 meters from the perimeter wells. [40 CFR 60.755(c)(2) and 62.14354(b)] Federally Enforceable Through Title V Permit

58. Permittee shall implement a program to monitor for cover integrity and implement cover repairs as necessary on a monthly basis. [40 CFR 60.755(c)(5) and 40 CFR 62.14354(b)] Federally Enforceable Through Title V Permit

59. The portable analyzer shall meet the instrument specifications of Method 21, section 3 (except that "methane" shall replace all references to VOC). The calibration gas shall be methane, diluted to a nominal concentration of 500 parts per million in air. To meet the performance evaluation requirements of Method 21, section 3.1.3, the instrument evaluation procedures of Method 21, section 4.4 shall be used. The calibration procedures provided in Method 21, section 4.2 shall be followed immediately before commencing a surface monitoring survey. The provisions of this condition apply at all times, except during periods of start-up, shutdown, or malfunction which shall not exceed 5 days for collections systems and shall not exceed 1 hour for treatment or control devices. [40 CFR 60.755(d), (e) and 62.14354(b)] Federally Enforceable Through Title V Permit

60. Each wellhead shall have a sampling port and a thermometer, other temperature-measuring device, or an access port for temperature measurements. [40 CFR 60.756(a)] Federally Enforceable Through Title V Permit

61. The enclosed flares shall be equipped with a temperature monitoring device equipped with a continuous recorder and having a minimum accuracy of +-1 percent of the temperature being measured expressed in degrees Celsius or +- 0.5 degrees Celsius, whichever is greater. The temperature indicator and recorder must operate continuously. [District Rule 2201 and 40 CFR 60.756(b)(1) and 62.14354(b) and 40 CFR part 64] Federally Enforceable Through Title V Permit

62. The owner/operator shall install, calibrate, maintain, and operate a meter with a continuous recording device that measures and records the landfill gas flow rate into the flare at least once every 15 minutes. This meter shall also be capable of measuring the landfill gas flow rate that might bypass the flare in the event of equipment malfunction or maintenance. [40 CFR 60.754(b)(1), 60.756(b)(2) and 62.14354(b)] Federally Enforceable Through Title V Permit

63. When performing surface monitoring, any closed landfill that has no monitored exceedances of the operational standard in three consecutive quarterly monitoring periods may skip to annual monitoring. Any methane reading of 500 ppm or more above background detected during the annual monitoring returns the frequency for that landfill to quarterly monitoring. [40 CFR 60.756(f) and 62.14354(b)] Federally Enforceable Through Title V Permit

64. The operator shall monitor and record maintenance-related and other control system downtimes and individual well shutdowns. Exceedances defined under 60.758(c) shall be reported once every 180 days. [District Rule 4102 and 40 CFR 60.757(f), (g)(4) and 60.758(c) and (e), and 62.14354(b)] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

65. Except as provided in 60.752(b)(2)(i)(B), each owner or operator of a controlled landfill shall keep up-to-date, readily accessible records for the life of the control equipment of the data listed in paragraphs 60.758(b)(1) through (b)(4) as measured during the initial performance test or compliance determination. Records of subsequent tests or monitoring shall be maintained for a minimum of 5 years. Records of the control device vendor specifications shall be maintained until removal. [40 CFR 60.758(b) and 62.14354(b)] Federally Enforceable Through Title V Permit

66. Permittee shall keep the following records: (1)(i) the maximum expected gas generation flow rate as calculated in 60.755(a)(1). The owner or operator may use another method to determine the maximum gas generation flow rate, if the method has been approved by the APCO; (ii) the density of wells, horizontal collectors, surface collectors, or other gas extraction devices determined using the procedures specified in 60.759(a)(1); (2)(i) the average combustion temperature measured at least every 15 minutes and averaged over the same time period of the performance test; (ii) the percent reduction of NMOC determined as specified in 60.752(b)(2)(iii)(B) achieved by the control device. [40 CFR 60.758(b)(1) and (2) and 62.14354(b)] Federally Enforceable Through Title V Permit

67. Except as provided in 60.752(b)(2)(i)(B), permittee shall keep, for the life of the collection system, an up-to-date, readily accessible plot map showing each existing and planned collector in the system and providing a unique identification location label for each collector. If applicable, permittee shall keep readily accessible documentation of the nature, date of deposition, amount, and location of asbestos-containing or nondegradable waste excluded from collection as well as any nonproductive areas excluded from collection. [40 CFR 60.758(d), 62.14354(b), and 60.34(c)] Federally Enforceable Through Title V Permit

68. Except as provided in 60.752(b)(2)(i)(B), permittee shall keep for at least 5 years up-to-date, readily accessible records of all collection and control system exceedances of the operational standards in 60.753, the reading in the subsequent month whether or not the second reading is an exceedance, and the location of each exceedance. [40 CFR 60.758(e)] Federally Enforceable Through Title V Permit

69. The landfill is no longer required to comply with the requirements of 40 CFR Part 63 Subpart AAAA when it is no longer required to apply controls as specified in the Federal plan or EPA approved and effective State plan or tribal plan that implements 40 CFR part 60, subpart Cc. [40 CFR 63.1950] Federally Enforceable Through Title V Permit

70. The permittee shall comply with the general provisions specified in Table 1 of 40 CFR Part 63 Subpart AAAA and 63.1960 through 63.1985 starting on the date required to install the gas collection and control system. [40 CFR 63.1955(b)] Federally Enforceable Through Title V Permit

71. The permittee shall maintain a copy of the SSM plan written according to the provisions in 40 CFR 63.6(e)(3). Failure to maintain a copy of the SSM plan is a deviation from the requirements of this subpart. [40 CFR 63.1960] Federally Enforceable Through Title V Permit

72. The permittee shall keep records and reports as specified in the Federal plan, EPA approved State plan or tribal plan that implements 40 CFR part 60, subpart Cc. The annual report described in 40 CFR 60.757(f) must be submitted every 6 months. [40 CFR 63.1980(a)] Federally Enforceable Through Title V Permit

73. The permittee shall maintain records as specified in the general provisions of 40 CFR part 60 and this part as shown in Table 1 of this subpart. Applicable records in the general provisions include items such as SSM plans and the SSM plan reports. [40 CFR 63.1980(b)] Federally Enforceable Through Title V Permit

74. The enclosed flare burner and its associated components and the vapor collection system shall be inspected on an annual basis. The records of inspection shall at least contain date and time of inspection, identification of the person performing an inspection, parts replacement and repairs, and all maintenance actions taken. The records shall be kept and maintained for compliance inspection upon request. [40 CFR part 64] Federally Enforceable Through Title V Permit

75. The permittee shall comply with the compliance assurance monitoring operation and maintenance requirements of 40 CFR part 64.7. [40 CFR part 64] Federally Enforceable Through Title V Permit

76. The permittee shall comply with the recordkeeping and reporting requirements of 40 CFR part 64.9. [40 CFR part 64] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

77. If the District or EPA determine that a Quality Improvement Plan is required under 40 CFR 64.7(d)(2), the permittee shall develop and implement the Quality Improvement Plan in accordance with 40 CFR part 64.8. [40 CFR part 64] Federally Enforceable Through Title V Permit

78. All records shall be retained for a minimum of 5 years, and shall be made available for District inspection upon request. [District Rule 1070 and 40 CFR 60.758(a) and (b) and 62.14354(b)] Federally Enforceable Through Title V Permit

79. Permittee may use actual landfill gas generation values in future expansion designs of the gas collection and control system(GCCS). All records and recovery data shall be submitted with GCCS plans. [17 CCR 95468]

80. Landfill collection and control system must be operated such that methane emission from the landfill do not exceed instantaneous or integrated limit requirements. [17 CCR 95464]

81. Landfill gas collection system components downstream of blower have a leak limit of 500 ppmv as methane. Components must be checked quarterly. If compliance with the methane limit has been demonstrated for 4 consecutive quarters, then the component checking frequency shall be annually. If an annual test fails to show compliance, quarterly testing shall resume. [17 CCR 95464]

82. Landfill collection and control system must be operated such that landfill surface methane emissions shall not exceed instantaneous surface emission limit of 500 ppmv as methane or integrated surface emission limit of 25 ppmv as methane. [17 CCR 95464, 17 CCR 95465]

83. Instantaneous and integrated landfill surface emissions measurements shall be done quarterly. The landfill may monitor annually provided they comply with requirements of 17 CCR 95469 (a)(1). [17 CCR 95469]

84. Permittee shall keep records of all gas collection system downtime exceeding five days, including individual well shutdown and disconnection times and the reason for downtime. [17 CCR 95470]

85. Permittee shall keep records of all gas control system downtime in excess of one hour, the reason for the downtime and the length of time the gas control system was shutdown. [17 CCR 95470]

86. Permittee shall keep records of the expected gas generation flow rate calculated pursuant to section 95471(e). [17 CCR 95470]

87. Permittee shall keep records of all instantaneous surface readings of 200 ppmv or greater; all exceedances of the limits in sections 95464(b)(1)(B) or 95465, including the location of the leak (or affected grid), leak concentration in ppmv, date and time of measurement, the action taken to repair the leak, date of repair, any required re-monitoring and the re-monitored concentration in ppmv, and wind speed during surface sampling; and the installation date and location of each well installed as part of a gas collection system expansion. [17 CCR 95470]

88. Permittee shall keep records of any positive wellhead gauge pressure measurements, the date of the measurements, the well identification number, and the corrective action taken. [17 CCR 95470]

89. Permittee shall conduct surface emission monitoring using either the procedures specified in section 95471 or the Los Angeles County Sanitation District monitoring procedure. Permittee shall keep records of which procedure was used. [17 CCR 95468]

90. Permittee shall keep records of delays encountered during repair of leaks or repair of positive wellhead readings. Documentation of delays shall be submitted with the annual report. [17 CCR 95468]

91. Permittee shall keep records of alternate landfill gas collection system modifications being implemented to correct an exceedance in the landfill gas surface emissions or wellhead pressure. Any alternative to installing a new well shall be documented and submitted with the annual report. [17 CCR 95468]

92. Permittee shall identify areas which are dangerous and unable to be inspected. Areas shall be clearly identified on a map of the facility. A copy of the map shall be kept onsite as well as submitted with the annual report. [17 CCR 95468]

93. Permittee shall conduct monitoring of the landfill surface within 3 inches of the surface. The facility may monitor surface emissions with the probe tip at the height of the vegetation if there is vegetation and it is impractical to monitor at 3 inches from the landfill surface. [17 CCR 95468]

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

94. Permittee shall terminate surface emission testing when the measured average wind speed is over 15 mph or the instantaneous wind speed is over 30 mph. [17 CCR 95468, 17 CCR 95471]

95. Permittee shall only conduct surface emission testing when precipitation has met the following requirements. It has been 24 hours since measured precipitation of 0.01 to 0.15 inches. It has been 48 hours since measured precipitation of 0.16 to 0.24 inches. It has been 72 hours since measured precipitation of 0.25 or more inches. [17 CCR 95468]

96. Permittee shall keep records of the annual solid waste acceptance rate and the current amount of waste-in-place. [17 CCR 95470]

97. Permittee shall keep records of the nature, location, amount , and date of deposition of non-degradable waste for any landfill areas excluded from the collection system. [17 CCR 95470]

98. Permittee shall keep records of any source tests conducted pursuant to section 95464(b)(4). [17 CCR 95470]

99. Permittee shall keep records describing the mitigation measures taken to prevent the release of methane or other emissions into the atmosphere during the following activities: 1. When solid waste was brought to the surface during the installation or preparation of wells, piping, or other equipment; 2. During repairs or the temporary shutdown of gas collection system components; or, 3. When solid waste was excavated and moved. [17 CCR 95470]

100. Permittee shall keep records of any construction activities pursuant to section 95466. The records must contain the following information: 1. A description of the actions being taken, the areas of the MSW landfill that will be affected by these actions, the reason the actions are required, and any landfill gas collection system components that will be affected by these actions. 2. Construction start and finish dates, projected equipment installation dates, and projected shut down times for individual gas collection system components. 3. A description of the mitigation measures taken to minimize methane emissions and other potential air quality impacts. [17 CCR 95470]

101. Permittee shall keep records of the equipment operating parameters specified to be monitored under section 95469(b)(1) as well as records for periods of operation during which the parameter boundaries established during the most recent source test are exceeded. The records must include the following information: 1. For enclosed flares, all 3-hour periods of operation during which the average temperature difference was more than 28 degrees Celsius (or 50 degrees Fahrenheit) below the average combustion temperature during the most recent source test at which compliance with sections 95464(b)(2) was determined and a gas flow rate device which must record the flow to the control device at least every 15 minutes. [17 CCR 95470]

102. Permittee shall submit the following reports as required in section 95470(b): Closure notification, Equipment removal report and Annual report. All reports must be accompanied by a certification of truth, accuracy, and completeness signed by a responsible official. [17 CCR 95470]

103. Permittee may comply with the CARB regulation for landfill methane control measures by using approved alternative compliance options. The permittee shall obtain written District approval for the use of any alternative compliance options not approved by this permit. Changes to the approved alternate compliance options must be made and approved in writing. Documentation of approved alternative compliance options shall be available for inspection upon request. [17 CCR 95468]

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: C-3115-3-2 **EXPIRATION DATE:** 07/31/2021

EQUIPMENT DESCRIPTION:
755 BHP CUMMINS MODEL QSX15-69 DIESEL-FIRED EMERGENCY IC ENGINE POWERING AN ELECTRICAL GENERATOR

PERMIT UNIT REQUIREMENTS

1. This engine shall be equipped with either a positive crankcase ventilation (PCV) system that recirculates crankcase emissions into the air intake system for combustion, or a crankcase emissions control device of at least 90% control efficiency. [District Rule 2201] Federally Enforceable Through Title V Permit
2. The exhaust stack shall vent vertically upward. The vertical exhaust flow shall not be impeded by a rain cap (flapper ok), roof overhang, or any other obstruction. [District Rule 4102]
3. Only CARB certified diesel fuel containing not more than 0.0015% sulfur by weight is to be used. [District Rules 2201 and 4801 and 17 CCR 93115] Federally Enforceable Through Title V Permit
4. This engine shall be equipped with a non-resettable hour meter with a minimum display capability of 9,999 hours, unless the District determines that a non-resettable hour meter with a different minimum display capability is appropriate in consideration of the historical use of the engine and the owner or operator's compliance history. [District Rule 4702, 17 CCR 93115, and 40 CFR 63 Subpart ZZZZ] Federally Enforceable Through Title V Permit
5. An emergency situation is an unscheduled electrical power outage caused by sudden and reasonably unforeseen natural disasters or sudden and reasonably unforeseen events beyond the control of the permittee. [District Rule 4702] Federally Enforceable Through Title V Permit
6. This engine shall not be used to produce power for the electrical distribution system, as part of a voluntary utility demand reduction program, or for an interruptible power contract. [District Rule 4702] Federally Enforceable Through Title V Permit
7. This engine shall be operated and maintained in proper operating condition as recommended by the engine manufacturer or emissions control system supplier. [District Rule 4702] Federally Enforceable Through Title V Permit
8. During periods of operation for maintenance, testing, and required regulatory purposes, the permittee shall monitor the operational characteristics of the engine as recommended by the manufacturer or emission control system supplier (for example: check engine fluid levels, battery, cables and connections; change engine oil and filters; replace engine coolant; and/or other operational characteristics as recommended by the manufacturer or supplier). [District Rule 4702 and 40 CFR 63 Subpart ZZZZ] Federally Enforceable Through Title V Permit
9. This engine shall be operated only for testing and maintenance of the engine, required regulatory purposes, and during emergency situations. Operation of the engine for maintenance, testing, and required regulatory purposes shall not exceed 50 hours per calendar year. [District Rule 4702, 17 CCR 93115, and 40 CFR 63 Subpart ZZZZ] Federally Enforceable Through Title V Permit
10. Operation of this engine for all purposes combined shall not exceed 10 hours per day. [District Rule 2201] Federally Enforceable Through Title V Permit
11. The permittee must minimize the engine's time spent at idle during startup and minimize the engine's startup time to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes. [40 CFR 63 Subpart ZZZZ] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

12. Particulate matter emissions shall not exceed 0.1 grains/dscf in concentration. [District Rule 4201] Federally Enforceable Through Title V Permit

13. Emissions from this engine shall not exceed any of the following limits: 5.7 g-NOx/hp-hr, 0.4 g-CO/hp/hr or 0.14 g-VOC/hp-hr. [District Rule 2201] Federally Enforceable Through Title V Permit

14. The PM10 emissions rate shall not exceed 0.08 g/hp-hr based on US EPA certification using ISO 8178 test procedure. [District Rule 2201] Federally Enforceable Through Title V Permit

15. The permittee shall maintain monthly records of the type of fuel purchased, the amount of fuel purchased, date when the fuel was purchased, signature of the permittee who received the fuel, and signature of the fuel supplier indicating that the fuel was delivered. [17 CCR 93115]

16. The permittee shall maintain monthly records of emergency and non-emergency operation. Records shall include the number of hours of emergency operation, the date and number of hours of all testing and maintenance operations, the purpose of the operation (for example: load testing, weekly testing, rolling blackout, general area power outage, etc.) and records of operational characteristics monitoring. For units with automated testing systems, the operator may, as an alternative to keeping records of actual operation for testing purposes, maintain a readily accessible written record of the automated testing schedule. [District Rule 4702 and 17 CCR 93115] Federally Enforceable Through Title V Permit

17. All records shall be maintained and retained on-site for a minimum of five (5) years, and shall be made available for District inspection upon request. For units at unstaffed sites or operated remotely, records may be maintained and retained at a District-approved off-site location. [District Rule 4702, 17 CCR 93115, and 40 CFR 63 Subpart ZZZZ] Federally Enforceable Through Title V Permit

18. The engine's oil and filter shall be changed every 500 hours of operation or every 12 months, whichever comes first. [40 CFR Subpart ZZZZ] Federally Enforceable Through Title V Permit

19. The permittee has the option of utilizing an oil analysis program in order to extend the specified oil change requirement in Tables 2c and 2d of Subpart ZZZZ. The oil analysis must be performed at the same frequency specified for changing the oil in Table 2c or 2d to this subpart. The analysis program must at a minimum analyze the following three parameters: Total Base Number, viscosity, and percent water content. The condemning limits for these parameters are as follows: Total Base Number is less than 30 percent of the Total Base Number of the oil when new; viscosity of the oil has changed by more than 20 percent from the viscosity of the oil when new; or percent water content (by volume) is greater than 0.5. If all of these condemning limits are not exceeded, the engine owner or operator is not required to change the oil. If any of the limits are exceeded, the engine owner or operator must change the oil within 2 days of receiving the results of the analysis; if the engine is not in operation when the results of the analysis are received, the engine owner or operator must change the oil within 2 days or before commencing operation, whichever is later. The owner or operator must keep records of the parameters that are analyzed as part of the program, the results of the analysis, and the oil changes for the engine. The analysis program must be part of the maintenance plan for the engine. [40 CFR 63 Subpart ZZZZ] Federally Enforceable Through Title V Permit

20. The engine's air filter shall be inspected every 1,000 hours of operation or every 12 months, whichever comes first, and replaced as necessary. [40 CFR 63 Subpart ZZZZ] Federally Enforceable Through Title V Permit

21. The engine's hoses and belts shall be inspected every 500 hours of operation or every 12 months, whichever comes first, and replaced as necessary. [40 CFR 63 Subpart ZZZZ] Federally Enforceable Through Title V Permit

22. The permittee shall maintain monthly records of the occurrence and duration of each malfunction of operation (i.e., process equipment) or the air pollution control and monitoring equipment. The permittee shall also maintain monthly records of action taken during periods of malfunction to minimize emissions in accordance with §63.6605(b), including corrective actions to restore malfunctioning process and air pollution control and monitoring equipment to its normal or usual manner of operation. [40 CFR 63 Subpart ZZZZ] Federally Enforceable Through Title V Permit

23. The engine shall be in full compliance with 40 CFR Part 63, Subpart ZZZZ (National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines). [40 CFR 63 Subpart ZZZZ] Federally Enforceable Through Title V Permit

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

August 4, 2023

Curtis Larkin
County of Fresno
Department of Public Works and Planning
2220 Tulare St. 6th Floor
Fresno, CA 93721

Subject: Applicability of Indirect Source Review (ISR) Rule 9510: Not Subject
Project Name: Phase III Module 9 & 10 Installation
ISR Determination Project No.: C20230221

Dear Mr. Larkin:

The San Joaquin Valley Air Pollution Control District (District) is in receipt of your correspondence dated June 22, 2023, requesting determination of the applicability of District Rule 9510 Indirect Source Review (Rule) to the above referenced project. The project consists of the expansion of the American Avenue Disposal Site (AADS), specifically modules 9 & 10 (Project). The Project is located at 18950 W. American Avenue, in Kerman, CA.

Per District Rule 9510 (Indirect Source Review) section 4.4.3, a development project on a facility whose primary functions are subject to District Rule 2201 or District Rule 2010 are exempt from the requirements of the Rule. The District has reviewed the information provided and has determined that the primary functions of this project are subject to District Rule 2201 (New and Modified Stationary Source Review Rule) or District Rule 2010 (Permits Required). Therefore, District Rule 9510 requirements and related fees do not apply to the Project.

As such, you are required to obtain a District Authority to Construct prior to installation of equipment that controls or may emit air contaminants, including but not limited to emergency internal combustion engines, boilers, and baghouses. For more information please visit http://www.valleyair.org/busind/pto/ptoforms/1ptoformidx.htm or contact the District's Small Business Assistance.

Please be aware that changes to the Project, i.e., change in land use type or increase in use intensity may exceed an applicability threshold, resulting in the Project being subject to District Rule 9510.

Samir Sheikh
Executive Director/Air Pollution Control Officer

Northern Region
4800 Enterprise Way
Modesto, CA 95356-8718
Tel: (209) 557-6400 FAX: (209) 557-6475

Central Region (Main Office)
1990 E. Gettysburg Avenue
Fresno, CA 93726-0244
Tel: (559) 230-6000 FAX: (559) 230-6061

Southern Region
34946 Flyover Court
Bakersfield, CA 93308-9725
Tel: (661) 392-5500 FAX: (661) 392-5585

www.valleyair.org www.healthyairliving.com

Also, enclosed is a document with answers to frequently asked questions regarding Indirect Source Review (ISR). This may be used as a reference to better understand ISR and how the District processes applications. Should the Project become subject to Rule 9510, an Air Impact Assessment (AIA) application must be submitted to the District, consistent with Section 5.0 of District Rule 9510. The AIA application can be downloaded from the District's website at http://www.valleyair.org/ISR/ISRFormsAndApplications.htm.

Please pay close attention to the following additional information:

- Dust Control Plan. Please be aware that you may be required to submit a Construction Notification Form or submit and receive approval of a Dust Control Plan prior to commencing any earthmoving activities as described in District Rule 8021 – *Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities*. Information on how to comply with Regulation VIII can be found online at: http://www.valleyair.org/busind/comply/PM10/compliance_PM10.htm.

To identify other District rules or regulations that apply to this Project or to obtain information about District rules and permit requirements, the applicant is strongly encouraged to visit www.valleyair.org or contact the District Small Business Assistance office at:

Fresno office:	(559) 230-5888
Modesto office:	(209) 557-6446
Bakersfield office:	(661) 392-5665

Thank you for your cooperation in this matter. If you have any questions, please contact Mr. Jacob Torrez by telephone at (559) 230-6558 or by email at jacob.torrez@valleyair.org.

Sincerely,

Brian Clements
Director of Permit Services

For: Mark Montelongo
Program Manager

SELF-DEALING TRANSACTION DISCLOSURE FORM

(1) Company Board Member Information:

Name: _____ Date: _____

Job Title: _____

(2) Company/Agency Name and Address:

_____

_____

_____

_____

(3) Disclosure (Please describe the nature of the self-dealing transaction you are a party to)

_____

_____

_____

_____

(4) Explain why this self-dealing transaction is consistent with the requirements of Corporations Code 5233 (a)

_____

_____

_____

_____

_____

_____

_____

(5) Authorized Signature

Signature: _____ Date: _____

SELF-DEALING TRANSACTION DISCLOSURE FORM INSTRUCTIONS

In order to conduct business with the County of Fresno (hereinafter referred to as "County"), members of a contractor's board of directors (hereinafter referred to as "County Contractor"), must disclose any self-dealing transactions that they are a party to while providing goods, performing services, or both for the County. A self-dealing transaction is defined below:

"A self-dealing transaction means a transaction to which the corporation is a party and which one or more of its directors has a material financial interest"

The definition above will be utilized for purposes of completing the disclosure form.

(1) Enter board member's name, job title (if applicable), and date this disclosure is being made.

(2) Enter the board member's company/agency name and address.

(3) Describe in detail the nature of the self-dealing transaction that is being disclosed to the County. At a minimum, include a description of the following:

   a. The name of the agency/company with which the corporation has the transaction; and

   b. The nature of the material financial interest in the Corporation's transaction that the board member has.

(4) Describe in detail why the self-dealing transaction is appropriate based on applicable provisions of the Corporations Codes.

(5) Form must be signed by the board member that is involved in the self-dealing transaction described in Sections (3) and (4).

REVISED STANDARD SPECIFICATIONS DATED 09-02-16

ORGANIZATION

Revised standard specifications are under headings that correspond with the main-section headings of the *Standard Specifications*. A main-section heading is a heading shown in the table of contents of the *Standard Specifications*. A date under a main-section heading is the date of the latest revision to the section.

Each revision to the *Standard Specifications* begins with a revision clause that describes or introduces a revision to the *Standard Specifications*. For a revision clause that describes a revision, the date on the right above the clause is the publication date of the revision. For a revision clause that introduces a revision, the date on the right above a revised term, phrase, clause, paragraph, or section is the publication date of the revised term, phrase, clause, paragraph, or section. For a multiple-paragraph or multiple-section revision, the date on the right above a paragraph or section is the publication date of the paragraphs or sections that follow.

Any paragraph added or deleted by a revision clause does not change the paragraph numbering of the *Standard Specifications* for any other reference to a paragraph of the *Standard Specifications*.

^^

DIVISION I GENERAL PROVISIONS

1 GENERAL

07-15-16

Add to the 1st table of section 1-1.06:

07-15-16

APCD	air pollution control district
AQMD	air quality management district
CISS	cast-in-steel shell
CSL	crosshole sonic logging
GGL	gamma-gamma logging

^^

7 LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

07-15-16

Replace the paragraphs in section 7-1.02I(2) with:

05-06-16

Under 2 CA Code of Regs § 11105:

1. During the performance of this contract, the recipient, contractor, and its subcontractors shall not deny the contract's benefits to any person on the basis of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, sexual orientation, or military and veteran status, nor shall they discriminate unlawfully against any employee or applicant for employment because of race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender

expression, age, sexual orientation, or military and veteran status. Contractor shall insure that the evaluation and treatment of employees and applicants for employment are free of such discrimination.

2. Contractor shall comply with the provisions of the Fair Employment and Housing Act (Gov. Code, § 12900 et seq.), the regulations promulgated thereunder (Cal. Code Regs., tit. 2, § 11000 et seq.), the provisions of Article 9.5, Chapter 1, Part 1, Division 3, Title 2 of the Government Code (Gov. Code, §§ 11135-11139.5), and the regulations or standards adopted by the awarding state agency to implement such article.
3. Contractor or recipient shall permit access by representatives of the Department of Fair Employment and Housing and the awarding state agency upon reasonable notice at any time during the normal business hours, but in no case less than 24 hours' notice, to such of its books, records, accounts, and all other sources of information and its facilities as said Department or Agency shall require to ascertain compliance with this clause.
4. Recipient, contractor and its subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement.
5. The contractor shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the contract.

Under 2 CA Code of Regs § 11122:

STANDARD CALIFORNIA NONDISCRIMINATION CONSTRUCTION CONTRACT SPECIFICATIONS (GOV. CODE SECTION 12990)

These specifications are applicable to all state contractors and subcontractors having a construction contract or subcontract of $5,000 or more.

1. As used in the specifications:
   a. "Act" means the Fair Employment and Housing Act.
   b. "Administrator" means Administrator, Office of Compliance Programs, California Department of Fair Employment and Housing, or any person to whom the Administrator delegates authority;
2. Whenever the contractor or any subcontractor subcontracts a portion of the work, it shall include in each subcontract of $5,000 or more the nondiscrimination clause in this contract directly or through incorporation by reference. Any subcontract for work involving a construction trade shall also include the Standard California Construction Contract Specifications, either directly or through incorporation by reference.
3. The contractor shall implement the specific nondiscrimination standards provided in paragraphs 6(a) through (e) of these specifications.
4. 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 members of any group protected by the Act shall excuse the contractor's obligations under these specifications, Government Code section 12990, or the regulations promulgated pursuant thereto.5. In order for the nonworking training hours of apprentices and trainees to be counted, such apprentices and trainees must be employed by the contractor during the training period, and the contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor or the California Department of Industrial Relations.
5. In order for the nonworking training hours of apprentices and trainees to be counted, such apprentices and trainees must be employed by the contractor during the training period, and the contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor or the California Department of Industrial Relations.
6. The contractor shall take specific actions to implement its nondiscrimination program. 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 must be able to demonstrate fully its efforts under steps a. through e. below:
   a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and at all facilities at which the contractor's employees are assigned to work. The contractor shall specifically ensure that all foremen, superintendents, and other on-site

supervisory personnel are aware of and carry out the contractor's obligations to maintain such a working environment.

b. Provide written notification within seven days to the director of the DFEH when the referral process of the union or unions with which the contractor has a collective bargaining agreement has impeded the contractor's efforts to meet its obligations.

c. Disseminate the contractor's equal employment opportunity policy by providing notice of the policy to unions and training, recruitment and outreach programs and requesting their cooperation in assisting the contractor to meet its obligations; and by posting the company policy on bulletin boards accessible to all employees at each location where construction work is performed.

d. Ensure all personnel making management and employment decisions regarding hiring, assignment, layoff, termination, conditions of work, training, rates of pay or other employment decisions, including all supervisory personnel, superintendents, general foremen, on-site foremen, etc., are aware of the contractor's equal employment opportunity policy and obligations, and discharge their responsibilities accordingly.

e. 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 equal employment opportunity policy and the contractor's obligations under these specifications are being carried out.

7. Contractors are encouraged to participate in voluntary associations that assist in fulfilling their equal employment opportunity obligations. The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on equal employment opportunity in the industry, ensures that the concrete benefits of the program are reflected in the contractor's workforce participation, and can provide access to documentation that demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's.
8. The contractor is required to provide equal employment opportunity for all persons. Consequently, the contractor may be in violation of the Fair Employment and Housing Act (Government Code section 12990 et seq.) if a particular group is employed in a substantially disparate manner.
9. The contractor shall not use the nondiscrimination standards to discriminate against any person because race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, sexual orientation, or military and veteran status.
10. The contractor shall not enter into any subcontract with any person or firm decertified from state contracts pursuant to Government Code section 12990.
11. The contractor shall carry out such sanctions and penalties for violation of these specifications and the nondiscrimination clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Government Code section 12990 and its implementing regulations by the awarding agency. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Government Code section 12990.
12. The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company equal employment opportunity policy is being carried out, to submit reports relating to the provisions hereof as may be required by OCP and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, 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 any easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

Add to the end of the 2nd sentence in the 1st paragraph of section 7-1.02K(1):

04-22-16

, and hauling and delivery of ready-mixed concrete.

Add between the 4th and 5th paragraphs of section 7-1.02K(3):

04-22-16

Submitted certified payrolls for hauling and delivering ready-mixed concrete must be accompanied by a written time record. The time record must include:

1. Truck driver's full name and address
2. Name and address of the factory or batching plant
3. Time the concrete was loaded at the factory or batching plant
4. Time the truck returned to the factory or batching plant
5. Truck driver's signature certifying under penalty of perjury that the information contained in this written time record is true and correct

Add between the 9th and 10th paragraphs of section 7-1.03:

07-15-16

If a height differential of more than 0.04 foot is created by construction activities at a joint transverse to the direction of traffic on the traveled way or a shoulder subject to public traffic, construct a temporary taper at the joint with a slope complying with the requirements shown in the following table:

Temporary Tapers

Height differential (foot)	Slope (horizontal:vertical)	
	Taper use of 14 days or less	Taper use of more than 14 days
Greater than 0.08	100:1 or flatter	200:1 or flatter
0.04–0.08	70:1 or flatter	70:1 or flatter

For a taper on existing asphalt concrete or concrete pavement, construct the taper with minor HMA under section 39-2.07.

Grind existing surfaces to accommodate a minimum taper thickness of 0.10 foot under either of the following conditions:

1. HMA material such as rubberized HMA, polymer-modified bonded wearing course, or open-graded friction course is unsuitable for raking to a maximum 0.02 foot thickness at the edge
2. Taper will be in place for more than 14 days

For a taper on a bridge deck or approach slab, construct the taper with polyester concrete under section 60-3.04B.

The completed surface of the taper must be uniform and must not vary more than 0.02 foot from the lower edge of a 12-foot straightedge when placed on its surface parallel and perpendicular to traffic.

If authorized, you may use alternative materials or methods to construct the required taper.

Replace *§ 337.15* in the 3rd item in the list in the paragraph of section 7-1.06B with:

05-06-16

§ 337.1

Add between the 1st and 2nd paragraphs of section 7-1.11A:

02-12-16

Comply with 46 CFR 381.7(a)–(b).

^^

8 PROSECUTION AND PROGRESS

07-15-16

Replace the table in the 3rd paragraph of section 8-1.10A with:

07-15-16

Liquidated Damages

Total bid		Liquidated damages per day
From over	To	
$0	$60,000	$1,400
$60,000	$200,000	$2,900
$200,000	$500,000	$3,200
$500,000	$1,000,000	$3,500
$1,000,000	$2,000,000	$4,000
$2,000,000	$5,000,000	$4,800
$5,000,000	$10,000,000	$6,800
$10,000,000	$20,000,000	$10,000
$20,000,000	$50,000,000	$13,500
$50,000,000	$100,000,000	$19,200
$100,000,000	$250,000,000	$25,300

^^

9 PAYMENT

01-15-16

Replace *may withhold* in the 1st paragraph of section 9-1.16E(4) with:

01-15-16

withholds

^^

DIVISION II GENERAL CONSTRUCTION

10 GENERAL

04-15-16

Replace section 10-1.02B with:

04-15-16

10-1.02B Traffic Elements

Before starting the operational test of a traffic management system that directly impacts traffic, the system must be ready for operation, and all signs, pavement delineation, and pavement markings must be in place at the system's location.

If maintaining existing traffic management system elements during construction is shown on the Bid Item List, a list of the systems shown within the project limits and their operational status is included in the *Information Handout*. Before starting job site activities, conduct a preconstruction operational status check of the existing system's elements and each element's communication status with the transportation management center to which it communicates. If an existing system element is discovered and has not been identified, the Department adds the element to the list of systems. The pre- and postconstruction operational status check of the discovered elements is change order work.

If maintaining existing traffic management system elements during construction is not shown on the Bid Item List and an existing system element is discovered during the work, notify the Engineer. The Engineer orders a pre- and postconstruction operational status check of the discovered elements. The status check of the discovered elements is change order work.

Conduct the status check with the Engineer and an electrical representative from the traffic operations office of the district in which the work is located. The Department provides you a list of the preconstruction operational status-check results, including:

1. Existing traffic management system elements and their locations within the project limits
2. Fully functioning elements
3. Nonoperational elements

Before Contract acceptance, conduct a postconstruction operational status check of all elements shown on the list with the Engineer and an electrical representative from the traffic operations office of the district in which the work is located.

Replace 10-3 of section 10 with:

04-15-16

10-2–10-3 RESERVED

^^

12 TEMPORARY TRAFFIC CONTROL

07-15-16

Replace section 12-3.32 with:

04-15-16

12-3.32 PORTABLE CHANGEABLE MESSAGE SIGNS

12-3.32A General

12-3.32A(1) Summary

Section 12-3.32A includes specifications for placing portable changeable message signs.

12-3.32A(2) Definitions

Reserved

12-3.32A(3) Submittals

If requested, submit a certificate of compliance for each PCMS.

Submit your cell phone number before starting the first activity that requires a PCMS.

12-3.32A(4) Quality Assurance

Reserved

12-3.32B Materials

Each PCMS must have a message board, controller unit, power supply, and a structural support system. The unit must be assembled to form a complete self-contained PCMS that can be delivered to the job site and placed into immediate operation. The sign unit must be capable of operating at an ambient air temperature from -4 to 158 degrees F and must be unaffected by mobile radio transmissions other than those required to control the PCMS.

A PCMS must be permanently mounted on a trailer, truck bed, or truck cab under the manufacturer's instructions. The PCMS must be securely mounted on the support vehicle such that it remains attached during any impact to the vehicle. If it is mounted on a trailer, the trailer must be capable of being leveled and plumbed.

A minimum of 3 feet of retroreflective material must be permanently affixed on all 4 sides of the trailer. The retroreflective material need not be continuous but must be visible on the same plane.

The sign panel must be capable of displaying a 3-line message with at least 7 characters per line. The characters must be at least 18 inches in height where the useable shoulder area is at least 15 feet wide.

To prevent encroachment onto the traveled way where the useable shoulder area is less than 15 feet wide, you may use a smaller message panel with at least 12-inch-high characters.

The message displayed on the sign must be visible from a distance of 1,500 feet and legible from a distance of 750 feet at noon on a cloudless day and during the night by persons with 20/20 vision or vision corrected to 20/20.

The characters on a sign panel may be 10 inches in height if:

1. PCMS is mounted on a service patrol truck or other incident response vehicle or used for traffic control operations on a highway facility where the posted speed limit is less than 40 mph
2. Message is legible from a distance of at least 650 feet at noon on a cloudless day and during the night by persons with 20/20 vision or vision corrected to 20/20

A matrix sign must provide a complete alphanumeric selection.

A PCMS must automatically adjust its brightness under varying light conditions to maintain the legibility of the message. The sign must be equipped with an automatic-dimming mode that automatically compensates for the influence of temporary light sources or abnormal lighting conditions. The sign must have 3 or more manual dimming modes of different intensities.

During the hours of darkness, a matrix sign not using lamps must be either internally or externally illuminated.

The controller must be an all solid-state unit containing the necessary circuitry for the storage of at least 5 preprogrammed messages. The controller must be installed at a location that allows the operator to perform all functions from a single position. The controller must have a keyboard entry system that allows the operator to generate an infinite number of additional messages in addition to the preprogrammed stored messages. The keyboard must be equipped with a security lockout feature to prevent unauthorized use of the controller.

The controller must have:

1. Nonvolatile memory that stores keyboard-created messages during periods when the power is not activated
2. Variable display rate that allows the operator to match the information display to the speed of approaching traffic
3. Screen upon which messages may be reviewed before being displayed on the sign

The flashing-off time must be adjustable from within the control cabinet.

12-3.32C Construction

Place a PCMS as far from the traveled way as practicable where it is legible to approaching traffic without encroaching on the traveled way. Where the vertical roadway curvature restricts the sight distance of approaching traffic, place the sign on or before the crest of the curvature where it is most visible to the approaching traffic. Where the horizontal roadway curvature restricts the sight distance of approaching traffic, place the sign at or before the curve where it is most visible to approaching traffic. Where practicable, place the sign behind guardrail or Type K temporary railing.

Make a taper consisting of 9 traffic cones placed 25 feet apart to delineate the location of a PCMS except where the sign is placed behind guardrail or Type K temporary railing.

When in full operation, the bottom of a sign must be at least 7 feet above the roadway in areas where pedestrians are anticipated and 5 feet above the roadway elsewhere, and the top of the sign must be not more than 14.5 feet above the roadway.

Operate the PCMS under the manufacturer's instructions.

Keep the PCMS clean to provide maximum visibility.

If multiple signs are needed, place each sign on the same side of the road at least 1,000 feet apart on freeways and expressways and at least 500 feet apart on other types of highways.

If more than one PCMS is simultaneously visible to traffic, only 1 sign may display a sequential message at any time. Do not use dynamic message displays, such as animation, rapid flashing, dissolving, exploding, scrolling, horizontal movement, or vertical movement of messages. The message must be centered within each line of the display.

You may use an additional PCMS if more than 2 phases are needed to display a message.

Display only messages shown or ordered.

Repeat the entire message continuously in not more than 2 phases of at least 3 seconds per phase. The sum of the display times for both of the phases must be a maximum of 8 seconds. If more than 2 phases are needed to display a message, use an additional PCMS.

You must be available by cell phone during activities that require a sign. Be prepared to immediately change the displayed message if ordered. You may operate the sign with a 24-hour timer control or remote control if authorized.

After the initial placement, move a sign from location to location as ordered.

When a PCMS is not in use, move it to an area at least 15 feet from the edge of the traveled way or remove it from the job site away from traffic.

12-3.32D Payment

Not Used

Add between the 1st sentence and 2nd sentences in the 1st paragraph of section 12-4.02A(3)(a):

07-15-16

For a project in District 7, submit the request at least 15 days before the proposed closure date.

Replace section 12-4.02C(2) with:

01-15-16

12-4.02C(2) Lane Closure System

12-4.02C(2)(a) General

The Department provides LCS training. Request the LCS training at least 30 days before submitting the 1st closure request. The Department provides the training within 15 days after your request.

LCS training is web-based or held at a time and location agreed upon by you and the Engineer. For web-based training, the Engineer provides you the website address to access the training.

With 5 business days after completion of the training, the Department provides LCS accounts and user IDs to your assigned, trained representatives.

Each representative must maintain a unique password and current user information in the LCS.

04-15-16

The project is not accessible in LCS after Contract acceptance.

01-15-16

12-4.02C(2)(b) Status Updates for Authorized Closures

Update the status of authorized closures using the LCS Mobile web page.

For a stationary closure, use code:

1. 10-97 immediately before you place the 1st advance warning sign
2. 10-98 immediately after you remove all of the advance warning signs

For a moving closure, use code:

1. 10-97 immediately before the actual start time of the closure
2. 10-98 immediately after the actual end time of the closure

Cancel an authorized closure by using code 10-22 within 2 hours after the authorized start time.

If you are unable to access the LCS Mobile web page, immediately notify the Engineer of the closure's status.

Replace the 1st sentence in the 3rd paragraph of section 12-6.03A with:

07-15-16

When the Engineer determines the temporary pavement delineation is no longer required for the direction of traffic, remove the temporary pavement delineation, including any underlying adhesive for temporary pavement markers, from the final layer of surfacing and from the pavement to remain in place.

^^

13 WATER POLLUTION CONTROL

09-02-16

Replace *General Industrial Permit* in the 2nd item in the list in the paragraph of section 13-1.01C(3) with:

05-06-16

Industrial General Permit

Replace the 2nd paragraph of section 13-1.01D(2) with:

05-06-16

Discharges from manufacturing facilities, such as batch plants and crushing plants, must comply with the discharge requirements in the NPDES General Permit for Storm Water Discharges Associated with Industrial Activities; Order No. 2014-0057-DWQ, CAS000001 (Industrial General Permit), issued by the SWRCB. For the Industrial General Permit, go to the SWRCB website.

Replace *General Industrial Permit* in the 3rd paragraph of section 13-1.01D(2) with:

05-06-16

Industrial General Permit

Replace the 2nd paragraph of section 13-3.01D(2) with:

09-02-16

For a project in the Lake Tahoe Hydrologic Unit, discharges of stormwater from the project must comply with the NPDES General Permit for General Waste Discharge Requirements and National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Construction Activity in the Lake Tahoe Hydrologic Unit, Counties of Alpine, El Dorado, and Placer, (Order No. R6T-2016-0010 and NPDES No. CAG616002). You may view the General Permit for the Lake Tahoe Hydrologic Unit at the Construction Storm Water Program page of the SWRCB website.

Replace the 2nd paragraph of section 13-8.01D(2) with:

09-02-16

For a project within the Lake Tahoe Hydrologic Unit, the design, installation, operation, and monitoring of the temporary ATS and monitoring of the treated effluent must comply with Attachment E of the NPDES General Permit for General Waste Discharge Requirements and National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Construction Activity in the Lake Tahoe Hydrologic Unit, Counties of Alpine, El Dorado, and Placer, (Order No. R6T-2016-0010 and NPDES No. CAG616002). You may view the General Permit for the Lake Tahoe Hydrologic Unit at the Construction Storm Water Program page of the SWRCB website.

^^

16 TEMPORARY FACILITIES

04-15-16

Add between the 1st and 2nd sentences of section 16-2.03A(1):

04-15-16

Constructing a high-visibility fence includes the installation of any signs specified in the special provisions.

^^

DIVISION III EARTHWORK AND LANDSCAPE

20 LANDSCAPE

07-15-16

Replace *86* in the 1st paragraph of section 20-2.01C(2) with:

04-15-16

87

Replace the 8th paragraph of section 20-2.01C(2) with:

07-15-16

Trenches for irrigation supply lines and conduits 3 inches and larger in diameter must be a minimum of 18 inches below the finished grade, measured to the top of the installed pipe.

Replace *86* in the 1st paragraph of section 20-2.01C(3) with:

04-15-16

87

Replace section 20-2.04A(4) with:

04-15-16

Perform conductors test. The test must comply with the specifications in section 87.

Where the conductors are installed by trenching and backfilling, perform the test after a minimum of 6 inches of backfill material has been placed and compacted over the conductors.

Replace the 1st paragraph of section 20-2.04C(4) with:

04-15-16

Splice low voltage control and neutral conductors under section 87, except do not use Method B.

Replace the 3rd paragraph of section 20-2.05B with:

07-15-16

The impeller must be glass reinforced nylon on a tungsten carbide shaft.

Replace *86* in the 2nd paragraph of section 20-2.06C with:

04-15-16

87

Replace section 20-2.07B(5) with:

04-15-16

20-2.07B(5) PVC Pipe Conduit Sleeve

PVC pipe conduit sleeves must be schedule 40 complying with ASTM D1785.

Fittings must be schedule 80.

Replace section 20-2.07C(3) with:

04-15-16

20-2.07C(3) PVC Pipe Conduit Sleeve

Where PVC pipe conduit sleeves 2 inches or less in outside diameter is installed under surfacing, you may install by directional boring under section 20-2.07C(2)(b).

For sleeves 2 inches or less in diameter, the top of the conduit must be a minimum of 18 inches below surfacing.

Extend sleeves 6 inches beyond surfacing. Cap ends of conduit until used.

Replace sections 20-2.09B and 20-2.09C with:

07-15-16

20-2.09B Materials

20-2.09B(1) General

Swing joints must match the inlet connection size of the riser.

Where shown, a sprinkler assembly must include a check valve.

Threaded nipples for swing joints and risers must be schedule 80, PVC 1120 or PVC 1220 pipe, and comply with ASTM D1785. Risers for sprinkler assemblies must be UV resistant.

Fittings for sprinkler assemblies must be injection-molded PVC, schedule 40, and comply with ASTM D2466.

Flexible hose for sprinkler assemblies must be leak-free, non-rigid and comply with ASTM D2287, cell Type 6564500. The hose must comply with ASTM D2122 and have the thickness shown in the following table:

Nominal hose diameter (inch)	Minimum wall thickness (inch)
1/2	0.127
3/4	0.154
1	0.179

Solvent cement and fittings for flexible hose must comply with section 20-2.08B(5).

20-2.09B(2) Pop-Up Sprinkler Assemblies

Each pop-up sprinkler assembly must include a body, nozzle, swing joint, pressure reducing device, fittings, and sprinkler protector where shown.

20-2.09B(3) Riser Sprinkler Assemblies

Each riser sprinkler assembly must include a body, flexible hose, threaded nipple, nozzle, swing joint (except for a Type V riser), pressure reducing device, fittings, and riser support where shown.

20-2.09B(4) Tree Well Sprinkler Assemblies

Each tree well sprinkler assembly must include a threaded nipple, nozzle, swing joint, fittings, perforated drainpipe, and drain grate.

The perforated drainpipe must be commercial-grade, rigid PVC pipe with holes spaced not more than 6 inches on center on 1 side of the pipe.

The drain grate must be a commercially-available, 1-piece, injection-molded grate manufactured from structural foam polyolefins with UV light inhibitors. Drain grate must be black.

Gravel for filling the drainpipe must be graded such that 100 percent passes the 3/4-inch sieve and 100 percent is retained on the 1/2-inch sieve. The gravel must be clean, washed, dry, and free from clay or organic material.

20-2.09C Construction

Where shown, install a flow shut-off device under the manufacturer's instructions, unless you use equipment with a preinstalled flow shut-off device.

Where shown, install a pressure reducing device under the manufacturer's instructions, unless you use equipment with a preinstalled pressure reducing device.

Install pop-up and riser sprinkler assembly:

1. From 6-1/2 to 8 feet from curbs, dikes, and sidewalks
2. At least 10 feet from paved shoulders
3. At least 3 feet from fences and walls

If sprinkler assembly cannot be installed within these limits, the location will be determined by the Engineer.

Set sprinkler assembly riser on slopes perpendicular to the plane of the slope.

Replace the paragraph of section 20-2.10B(3) with:

07-15-16

Each check valve must be one of the following:

1. Schedule 80 PVC with a factory setting to withstand a minimum 7-foot head on risers
2. Class 200 PVC if used on a nonpressurized plastic irrigation supply line
3. Internal to the sprinkler body with a factory setting to withstand a minimum 7-foot head

Replace the paragraph of section 20-2.10C(3) with:

07-15-16

Install check valves as necessary to prevent low-head drainage.

Replace the paragraphs of section 20-3.01B(10) with:

07-15-16

Each plant stake for vines must be nominal 1 by 1 inch and 18 inches long.

Each plant stake for trees must be nominal 2 by 2 inches or nominal 2 inches in diameter and long enough to keep the tree in an upright position.

Replace the paragraph of section 20-3.01B(11) with:

07-15-16

Each plant tie for vines must be extruded vinyl-based tape, 1 inch wide and at least 8 mils thick.

Each plant tie for trees must be a (1) minimum 3/4-inch-wide, UV-resistant, flexible vinyl tie complying with ASTM D412 for tensile and elongation strength, or (2) lock-stitch, woven polypropylene with a minimum 900 lb tensile strength.

Add between the 7th and 8th paragraphs of section 20-3.02C(3)(b):

07-15-16

Spread the vine shoots and tie them with a plant tie to each stake above the crossing point.

Replace the 8th paragraph of section 20-3.02C(3)(b) with:

07-15-16

Tie trees to the stakes with 2 tree ties, 1 tie to each stake. Each tie must form a figure eight by crossing the tie between the tree and the stake. Install ties at the lowest position that will support the tree in an upright position. Install the ties such that they provide trunk flexibility but do not allow the trunk to rub against the stakes. Wrap each end of the tie 1-1/2 turns around the stake and securely tie or nail it to the stake.

Replace the 1st paragraph of section 20-5.02C(1) with:

07-15-16

Where edging is used to delineate the limits of inert ground cover or wood mulch areas, install the edging before installing the inert ground cover or wood mulch.

07-15-16

Delete *AND MULCHES* in the heading of section 20-5.03.

07-15-16

Delete *and mulches* in the paragraph of section 20-5.03A(1)(a).

Replace the paragraph of section 20-5.03A(3)(a) with:

07-15-16

Before installing inert ground cover, remove plants and weeds to the ground level.

07-15-16

Delete *or mulch* at each occurrence in sections 20-5.03A(3)(c) and 20-5.03A(3)(d).

Replace section 20-5.03E with:

07-15-16

20-5.03E Reserved

Replace section 20-5.04 with:

07-15-16

20-5.04 WOOD MULCH

20-5.04A General

20-5.04A(1) Summary

Section 20-5.04 includes specifications for placing wood mulch.

20-5.04A(2) Definitions

Reserved

20-5.04A(3) Submittals

Submit a certificate of compliance for wood mulch.

Submit a 2 cu ft mulch sample with the mulch source shown on the bag. Obtain authorization before delivering the mulch to the job site.

20-5.04A(4) Quality Assurance

Reserved

20-5.04B Materials

20-5.04B(1) General

Mulch must not contain more than 0.1 percent of deleterious materials such as rocks, glass, plastics, metals, clods, weeds, weed seeds, coarse objects, sticks larger than the specified particle size, salts, paint, petroleum products, pesticides or chemical residues harmful to plant or animal life.

20-5.04B(2) Tree Bark Mulch

Tree bark mulch must be derived from cedar, Douglas fir, or redwood species.

The mulch must be ground such that at least 95 percent of the material by volume is less than 2 inches long in any dimension and no more than 30 percent by volume is less than 1 inch long in any dimension.

20-5.04B(3) Wood Chip Mulch

Wood chip mulch must:

1. Be derived from clean wood
2. Not contain leaves or small twigs
3. Contain at least 95 percent by volume of wood chips with a width and thickness from 1/16 to 3/8 inch and a length from 1/2 to 3 inches

20-5.04B(4) Shredded Bark Mulch

Shredded bark mulch must:

1. Be derived from trees
2. Be a blend of loose, long, thin wood, or bark pieces
3. Contain at least 95 percent by volume of wood strands with a width and thickness from 1/8 to 1-1/2 inches and a length from 2 to 8 inches

20-5.04B(5) Tree Trimming Mulch

Tree trimming mulch must:

1. Be derived from chipped trees and may contain leaves and small twigs
2. Contain at least 95 percent by volume of material less than 3 inches long for any dimension and not more than 30 percent by volume of material less than 1 inch long for any dimension

20-5.04B(6)–20-5.04B(11) Reserved

20-5.04C Construction

Before placing wood mulch, remove plants and weeds to the ground level.

Maintain the planned flow lines, slope gradients, and contours of the job site. Grade the subgrade to a smooth and uniform surface.

Place mulch after the plants have been planted.

Place mulch in the plant basin at the rate described. Mulch must not come in contact with the plant crown and stem.

Place mulch as shown in areas outside of plant basins to a uniform thickness.

Spread mulch from the outside edge of the plant basin to the adjacent edges of shoulders, paving, retaining walls, dikes, edging, curbs, sidewalks, walls, fences, and existing plantings. If the plant is 12 feet or more from the adjacent edges of any of these elements, spread the mulch 6 feet beyond the outside edge of the plant basin.

Do not place mulch within 4 feet of:

1. Flow line of earthen drainage ditches
2. Edge of paved ditches
3. Drainage flow lines

20-5.04D Payment

The payment quantity for wood mulch is the volume measured in the vehicle at the point of delivery.

^^

21 EROSION CONTROL

07-15-16

Add between *tube* and *12* in the 1st paragraph of section 21-2.02Q:

07-15-16

8 or

^^

DIVISION IV SUBASES AND BASES

23 GENERAL

07-15-16

Replace the headings and paragraphs in section 23 with:

07-15-16

23-1 GENERAL

23-1.01 GENERAL

23-1.01A Summary

Section 23 includes general specifications for constructing subbases and bases.

23-1.01B Definitions

Reserved

23-1.01C Submittals

Submit a QC plan for the types of subbases or bases where described.

23-1.01D Quality Assurance

23-1.01D(1) General

23-1.01D(1)(a) General

Take samples under California Test 125.

23-1.01D(1)(b) Test Result Disputes

You and the Engineer must work together to avoid potential conflicts and to resolve disputes regarding test result discrepancies. Notify the Engineer within 5 business days of receiving the test result if you dispute the test result.

If you or the Engineer dispute each other's test results, submit your test results and copies of paperwork including worksheets used to determine the disputed test results. An independent third party performs referee testing. Before the independent third party participates in a dispute resolution, it must be qualified under AASHTO Materials Reference Laboratory program and the Department's Independent Assurance Program. The independent third party must have no prior direct involvement with this Contract. By mutual agreement, the independent third party is chosen from:

1. Department laboratory in a district or region not in the district or region the project is located
2. Transportation Laboratory
3. Laboratory not currently employed by you or your material producer

If split acceptance samples are not available, the independent third party uses any available material representing the disputed material for evaluation.

If the independent third party determines the Department's test results are valid, the Engineer deducts the independent third party testing costs from payments. If the independent third party determines your test results are valid, the Department pays the independent third party testing costs.

23-1.01D(2) Quality Control

23-1.01D(2)(a) General

Provide a QC manager when the quantity of subbase or base is as shown in the following table:

QC Manager Requirements

Subbase or base	Requirement
Stabilized soil (sq yd)	≥ 20,000
Aggregate subbases (cu yd)	≥ 20,000
Aggregate bases (cu yd)	≥ 20,000
CTB (cu yd)	≥ 10,000
Lean concrete base (cu yd)	≥ 2,000
Rapid strength concrete base (cu yd)	≥ 1,000
Lean concrete base rapid setting (cu yd)	≥ 1,000
Concrete base (cu yd)	≥ 1,000
Treated permeable bases (cu yd)	≥ 2,000
Reclaimed pavements (sq yd)	≥ 10,000

Provide a testing laboratory to perform quality control tests. Maintain sampling and testing equipment in proper working condition.

You are not entitled to compensation for the suspension of work resulting from noncompliance with quality control requirements, including those identified within the QC plan.

23-1.01D(2)(b) Quality Control Plan

The QC plan must describe the organization and procedures used to:

1. Control the production process
2. Determine if a change to the production process is needed
3. Implement a change

The QC plan must include action and suspension limits and details of corrective action to be taken if any process is outside of those limits. Suspension limits must not exceed specified acceptance criteria.

The QC plan must describe how test results will be submitted including times for sampling and testing for each quality characteristic.

23-1.01D(2)(c) Qualifications

Testing laboratories and testing equipment must comply with the Department's Independent Assurance Program.

Personnel performing sampling and testing must be qualified under the Department's Independent Assurance Program for the sampling and testing performed.

23-1.01D(3) Department Acceptance

Reserved

23-1.02 MATERIALS

Not Used

23-1.03 CONSTRUCTION

Not Used

23-1.04 PAYMENT

Not Used

23-2–23-7 RESERVED

^^

24 STABILIZED SOILS

07-15-16

Add to section 24-1.01C(1):

07-15-16

Submit a stabilized soil quality control plan.

Add to section 24-1.01D(1):

07-15-16

Construct test pads for compaction tests by scraping away material to the depth ordered. If a compaction test fails, corrective action must include the layers of material already placed above the test pad elevation.

Replace section 24-1.01D(2) with:

07-15-16

24-1.01D(2) Quality Control

24-1.01D(2)(a) General

Reserved

24-1.01D(2)(b) Quality Control Plan

Reserved

24-1.01D(2)(c) Qualifications

Reserved

24-1.01D(2)(d) Preparing Basement Material

After preparing an area for soil stabilization, verify the surface grades.

24-1.01D(2)(e) Mixing

Except for clods larger than 1 inch, randomly test the adequacy of the mixing with a phenolphthalein pH indicator solution.

Replace the 1st paragraph of section 24-1.03C with:

07-15-16

The Engineer orders the application rate as pounds of stabilizing agent per square yard of basement material to be stabilized.

07-15-16

Delete section 24-2.01D(1)(c)

Replace *250* in the 2nd sentence in the 2nd paragraph of section 24-2.01D(2)(c) with:

07-15-16

500

Add to section 24-2.01D(2):

07-15-16

24-2.01D(2)(d) Quality Control Testing

Lime stabilized soil quality control must include testing the quality characteristics at the frequencies shown in the following table:

QC Testing Frequencies

Quality characteristic	Test method	Sampling location	Minimum frequency
Ground surface temperature before adding lime and full depth ground temperature during mixing operations	--	Each temperature location	1 test per 20,000 sq ft, minimum 1 per day
Lime application rate	Calibrated tray or equal	Roadway	1 test per 40,000 sq ft, minimum 2 per day
Gradation on mixed material	California Test 202	Roadway	1 per 500 cu yd, minimum 1 per day
Moisture content	California Test 226	Roadway	1 per 500 cu yd on each layer, each day during mixing and mellowing periods, minimum 1 per day
Relative compaction	California Test 231	Roadway	1 per 500 cu yd on each layer, minimum 1 per day

^^

25 AGGREGATE SUBBASES

07-15-16

Replace *Reserved* in section 25-1.01C with:

07-15-16

Submit an aggregate subbase QC plan.

Replace *Reserved* in section 25-1.01D(2) with:

07-15-16

25-1.01D(2)(a) General

Reserved

25-1.01D(2)(b) Quality Control Plan

Reserved

25-1.01D(2)(c) Qualifications

Reserved

25-1.01D(2)(d) Quality Control Testing

AS quality control must include testing the quality characteristics at the frequencies shown in the following table:

QC Testing Frequencies

Quality characteristic	Test method	Sampling location	Minimum frequency
R-value	California Test 301	Stockpiles, transportation units, windrows, or roadways	1 test before beginning work and every 2000 cu yd thereafter[a]
Aggregate gradation	California Test 202	Stockpiles, transportation units, windrows, or roadways	1 per 500 cu yd but at least one per day of placement
Sand equivalent	California Test 217	Stockpiles, transportation units, windrows, or roadways	
Relative compaction	California Test 231	Roadway	1 per 500 sq yd on each layer

[a]Additional R-value frequency testing will not be required when the average of 4 consecutive sand equivalent tests is 4 or more above the specified operating range value.

Add between the 2nd and 3rd paragraphs of section 25-1.01D(3):

07-15-16

The Engineer takes aggregate subbase samples for R-value, aggregate gradation, and sand equivalent from any of the following locations:

1. Windrow
2. Roadway

07-15-16

Delete *for each noncompliant test result* in the 4th paragraph of section 25-1.01D(3).

07-15-16

Delete *a* in the 5th paragraph of section 25-1.01D(3).

^^

26 AGGREGATE BASES

07-15-16

Replace *Reserved* in section 26-1.01C with:

07-15-16

Submit an aggregate base QC plan.

Replace *Reserved* in section 26-1.01D(1) with:

07-15-16

Aggregate samples must not be treated with lime, cement, or chemicals before testing for durability index. Aggregate from untreated reclaimed processed AC, PCC, LCB, or CTB is not considered treated.

Replace *Reserved* in section 26-1.01D(2) with:

07-15-16

26-1.01D(2)(a) General

Reserved

26-1.01D(2)(b) Quality Control Plan

Reserved

26-1.01D(2)(c) Qualifications

Reserved

26-1.01D(2)(d) Quality Control Testing

AB quality control must include testing the quality characteristics at the frequencies shown in the following table:

QC Testing Frequencies

Quality characteristic	Test method	Sampling location	Minimum frequency
R-value	California Test 301	Stockpiles, transportation units, windrows, or roadways	1 test before starting work and every 2,000 cu yd thereafter[a]
Aggregate gradation	California Test 202	Stockpiles, transportation units, windrows, or roadways	1 per 500 cu yd but at least one per day of placement
Sand equivalent	California Test 217	Stockpiles, transportation units, windrows, or roadways	
Durability index[b]	California Test 229	Stockpiles, transportation units, windrows, or roadways	1 per project
Relative compaction	California Test 231	Roadway	1 per 500 sq yd on each layer

[a]Additional R-value frequency testing will not be required when the average of 4 consecutive sand equivalent tests is 29 or greater for Class 2 AB or 25 or greater for Class 3 AB.
[b]Applies if section 26-1.02 contains an applicable requirement for durability index

Add between *requirements,* and *and* in the 1st paragraph of section 26-1.01D(3):

07-15-16

durability,

Add between the 2nd and 3rd paragraphs of section 26-1.01D(3):

07-15-16

The Engineer takes aggregate base samples for R-value, aggregate gradation, sand equivalent, and durability index from any of the following locations:

1. Windrow
2. Roadway

07-15-16

Delete the 3rd paragraph of section 26-1.01D(3).

^^

27 CEMENT TREATED BASES

07-15-16

Add to section 27-1.01C:

07-15-16

Submit cement treated base QC plan.

Replace the headings and paragraphs in section 27-1.01D with:

07-15-16

27-1.01D Quality Assurance

27-1.01D(1) General

After the CTB has been spread on the subgrade and before initial compaction, the cement content of the completed mixture of CTB must not vary from the specified cement content by more than 0.6 percent of the weight of the dry aggregate when tested under California Test 338.

For Class A CTB, compaction is tested under California Test 312 or 231.

The relative compaction of CTB must be at least 95 percent. Each layer of CTB may be tested for compaction, or all layers may be tested together at the option the Engineer. If all layers are tested together, you are not relieved of the responsibility to achieve the required compaction in each layer placed.

27-1.01D(1)(a) Aggregate

When tested under California Test 301, aggregate for Class B CTB must have (1) an R-value of at least 60 before mixing with cement and (2) an R-value of at least 80 when aggregate is mixed with an amount of cement that does not exceed 2.5 percent by weight of the dry aggregate.

Before sand equivalent testing, aggregate samples must not be treated with lime, cement, or chemicals.

If the aggregate gradation test results, the sand equivalent test results, or both comply with contract compliance requirements but not operating range requirements, you may continue placing CTB for the remainder of the work day. Do not place additional CTB until you demonstrate to the Engineer that the CTB to be placed complies with the operating range requirements.

If the aggregate gradation test results, sand equivalent test results, or both do not comply with contract compliance requirements, remove the CTB or request a payment deduction. If your request is authorized, $2.50/cu yd is deducted. If CTB is paid for by weight, the Engineer converts tons to cubic yards for the purpose of reducing payment for noncompliant CTB left in place. An aggregate gradation and a sand equivalent test represents up to (1) 500 cu yd or (2) 1 day's production if less than 500 cu yd.

27-1.01D(1)(b) Road-Mixed Cement Treated Base Moisture Content

Just before initial compaction the moisture content of the completed mixture must be at least the optimum moisture content less 1 percent. The moisture content is determined under California Test 226 and optimum moisture content is determined under California Test 312.

27-1.01D(1)(c) Plant-Mixed Cement Treated Base Moisture Content

At the point of delivery to the work, the moisture content of the completed mixture must be at least the optimum moisture content less 1 percent. The moisture content is determined under California Test 226 and optimum moisture content under California Test 312.

27-1.01D(2) Quality Control

27-1.01D(2)(a) General

Reserved

27-1.01D(2)(b) Quality Control Plan

Reserved

27-1.01D(2)(c) Qualifications

Reserved

27-1.01D(2)(d) Quality Control Testing

CTB quality control must include testing the quality characteristics at the frequencies shown in the following table:

QC Testing Frequencies

Quality characteristic	Test method	Sampling location	Minimum frequency
Aggregate gradation	California Test 202 modified	Stockpiles, plant, transportation units, windrow, or roadway	1 per 500 cu yd but at least one per day of placement
Sand equivalent	California Test 217	Stockpiles, plant, transportation units, windrow, or roadway	
R-value[a]	California Test 301	Stockpiles, plant, transportation units, windrows, or roadway	1 test before starting work and every 2000 cu yd thereafter[b]
Optimum moisture content	California Test 312	Plant, transportation units, windrow, or roadway	1 per day of placement
Moisture content	California Test 226	Roadway	1 per 500 cu yd but at least one per day of placement
Cement content	California Test 338	Windrows or roadway	1 per 1000 cu yd but at least one per day of placement
Relative compaction	California Test 312 or 231	Roadway	1 per 2000 sq yd but at least one per day of placement
Compressive strength[c]	California Test 312	Windrow or roadways	1 per day of placement

[a]R-value is required for Class B CTB only

[b]Additional R-value frequency testing will not be required while the average of 4 consecutive sand equivalent tests is 4 or more above the specified operating range value.

[c]Compressive strength is required for Class A CTB only when specified

27-1.01D(3) Department Acceptance

The Department's acceptance testing includes testing the CTB quality characteristics shown in the following table:

CTB Requirements for Acceptance

Quality characteristic	Test method
Aggregate gradation	California Test 202 modified
Sand equivalent	California Test 217
R-value[a]	California Test 301
Optimum moisture content	California Test 312
Moisture content	California Test 226
Cement content	California Test 338
Relative compaction	California Test 312 or 231
Compressive strength[b]	California Test 312

[a]R-value is required for Class B CTB only

[b]Compressive strength is required for Class A CTB only when specified

The Engineer takes samples for aggregate gradation and sand equivalent from any of the following locations:

1. Plant

2. Truck
3. Windrow, for road-mixed only
4. Roadbed, for road-mixed only

Add to section 27-1.02:

07-15-16

Water must comply with section 90-1.02D.

Add to section 27-1.03F:

07-15-16

The relative compaction of CTB must be at least 95 percent.

^^

28 CONCRETE BASES

07-15-16

Replace the headings and paragraphs in section 28-1.01D with:

07-15-16

28-1.01D Quality Assurance

28-1.01D(1) General

Aggregate samples must not be treated with lime, cement, or chemicals before testing for sand equivalent.

Stop concrete base activities and immediately notify the Engineer whenever:

1. Any QC or QA test result does not comply with the specifications
2. Visual inspection shows a noncompliant concrete base

If concrete base activities are stopped, before resuming activities:

1. Notify the Engineer of the adjustments you will make
2. Remedy or replace the noncompliant concrete base
3. Field qualify or construct a new test strip as specified for the concrete base involved to demonstrate compliance with the specifications
4. Obtain authorization

28-1.01D(2) Quality Control

28-1.01D(2)(a) General

Reserved

28-1.01D(2)(b) Quality Control Plan

Reserved

28-1.01D(2)(c) Qualifications

Reserved

28-1.01D(3) Department Acceptance

Reserved

Add to section 28-2.01C(1):

07-15-16

Submit a lean concrete base QC plan.

Replace the headings and paragraphs in section 28-2.01D with:

07-15-16

28-2.01D Quality Assurance

28-2.01D(1) General

28-2.01D(1)(a) General

The molds for compressive strength testing under ASTM C31 or ASTM C192 must be 6 by 12 inches.

If the aggregate gradation test results, sand equivalent test results or both comply with the contract compliance requirements but not the operating range requirements, you may continue placing LCB for the remainder of the work day. Do not place additional LCB until you demonstrate the LCB to be placed complies with the operating range requirements.

28-2.01D(1)(b) Qualifications

Field qualification tests and calculations must be performed by an ACI certified "Concrete Laboratory Technician, Grade I.

28-2.01D(1)(c) Aggregate Qualification Testing

Qualify the aggregate for each proposed aggregate source and gradation. The qualification tests include (1) a sand equivalent and (2) an average 7-day compressive strength under ASTM C39 of 3 cylinders manufactured under ASTM C192 except cure cylinders in molds without lids after initial curing.

For the compressive strength test, the cement content for each cylinder must be 300 lb/cu yd. The 7-day average compressive strength must be at least 610 psi. The cement must be Type II portland cement.

LCB must have from 3 to 4 percent air content during aggregate qualification testing.

28-2.01D(1)(d) Field Qualification Testing

Before placing LCB, you must perform field qualification testing and obtain authorization for each mix design. Retest and obtain authorization for changes to the authorized mix designs.

Notify the Engineer at least 5 business days before field qualification. Perform the field qualification at the job site or an authorized location.

Field qualification testing includes tests for compressive strength, air content, and penetration or slump.

For compressive strength field qualification testing:

1. Prepare 12 cylinders under ASTM C31 except final cure cylinders in molds without lids from a single batch.
2. Perform 3 tests; each test consists of determining the average compressive strength of 2 cylinders at 7 days under ASTM C39. The average compressive strength for each test must be at least 530 psi

If you submitted a notice to produce LCB qualifying for a transverse contraction joint waiver, manufacture additional specimens and test the LCB for compressive strength at 3 days. Prepare the compressive strength cylinders under ASTM C31 except final cure cylinders in molds without lids at the same time using the same material and procedures as the 7-day compressive strength cylinders except do not submit 6 additional test cylinders. The average 3-day compressive strength for each test must be not more than 500 psi.

28-2.01D(2) Quality Control

28-2.01D(2)(a) General

Reserved

28-2.01D(2)(b) Quality Control Manager

Reserved

28-2.01D(2)(c) Quality Control Testing

Test the LCB under the test methods and at the locations and frequencies shown in the following table:

LCB Sampling Location and Testing Frequencies

Quality characteristic	Test method	Sampling location	Minimum sampling and testing frequency
Sand equivalent	ASTM D2419	Source	1 per 500 cubic yards but at least 1 per day of production
Aggregate gradation	ASTM C136		
Air content	ASTM C231	Job site	
Penetration[a]	ASTM C360		
Slump[a]	ASTM C143		
Compressive strength	ASTM C39[b]		

[a]Test for either penetration or slump

[b]Prepare cylinders under ASTM C31 except final cure cylinders in molds without lids.

28-2.01D(3) Department Acceptance

The Department accepts LCB based on compliance with the requirements shown in the following table:

LCB Requirements for Acceptance

Quality characteristic	Test method	Requirement
Compressive strength (min, psi at 7 days)	ASTM C39[a]	530[b]

[a] Cylinders prepared under ASTM C31 except final cure cylinders in molds without lids.

[b] A compressive strength test represents up to (1) 1,000 cu yd or (2) 1 day's production if less than 1,000 cu yd.

Replace *section 28-2.01D(4)* in item 3 of the 5th paragraph in section 28-2.03D with:

07-15-16

section 28-2.01D(1)(c)

Replace the 1st paragraph in section 28-2.03F with:

07-15-16

After finishing LCB, cure LCB with pigmented curing compound under section 90-1.03B(3) and 40-1.03I. Apply curing compound:

1. In 2 separate applications
2. Before the atmospheric temperature falls below 40 degrees F
3. At a rate of 1 gal/150 sq ft for the first application
4. At a rate of 1 gal/200 sq ft for the second application

Replace *Reserved* in section 28-3.01C(3) with:

07-15-16

Submit a rapid strength concrete base QC plan.

Replace the headings and paragraphs in section 28-3.01D with:

07-15-16

28-3.01D Quality Assurance

28-3.01D(1) General

28-3.01D(1)(a) General

At the preconstruction meeting be prepared to discuss the project specifications and methods of performing each item of work. Items discussed must include the processes for:

1. Production
2. Transportation

3. Placement
4. QC plan, if specified in the special provisions
5. Contingency plan
6. QC sampling and testing
7. Acceptance criteria

Beams for modulus of rupture testing must be fabricated and tested under California Test 524. The beams may be fabricated using an internal vibrator under ASTM C31. For each test, 3 beam must be fabricated and the test results averaged. No single test represents more than that day's production or 130 cu yd, whichever is less.

For early age testing, beams must be cured so the monitored temperatures in the beams and the test strip are always within 5 degrees F. The internal temperatures of the RSC base and early age beams must be monitored and recorded at intervals of at least 5 minutes. Thermocouples or thermistors connected to strip-chart recorders or digital data loggers must be installed to monitor the temperatures. Temperature recording devices must be accurate to within ±2 degrees F. Until early age testing is completed, internal temperatures must be measured at 1 inch from the top, 1 inch from the bottom, and no closer than 3 inches from any edge.

For other age testing, beams must be cured under California Test 524 except beams must be placed into sand at a time that is the earlier of either from 5 to 10 times the final set time, or 24 hours.

RSC base must have an opening age modulus of rupture of not less than 400 psi and a 7-day modulus of rupture of not less than 600 psi.

28-3.01D(1)(b) Preconstruction Meeting

Reserved

28-3.01D(1)(c) Test Strip

Reserved

28-3.01D(2) Quality Control

28-3.01D(2)(a) General

Reserved

28-3.01D(2)(b) Quality Control Manager

Reserved

28-3.01D(2)(c) Quality Control Testing

Test the rapid strength concrete base under the test methods and at the locations and frequencies shown in the following table:

Rapid Strength Concrete Base Sampling Location and Testing Frequencies

Quality characteristic	Test method	Sample Location	Minimum testing frequency[a]
Cleanness value	California Test 227	Source	1 per 500 cubic yards but at least 1 per shift
Sand equivalent	California Test 217		
Aggregate gradation	California Test 202		
Air content	California Test 504	Job site	1 per 130 cu yd but at least 1 per shift
Yield	California Test 518		1 per shift
Slump or penetration	ASTM C143 or California Test 533		1 per 2 hours of placement
Density	California Test 518		1 per shift
Aggregate moisture meter calibration[b]	California Test 223 or California Test 226		1 per shift
Modulus of rupture	California Test 524		1 per 130 cu yd but at least 1 per shift

[a]Test at the most frequent interval.

[b]Check calibration of the plant moisture meter by comparing moisture meter readings with California Test 223 or California Test 226 test results.

Notify the Engineer at least 2 business days before any sampling and testing. Submit testing results within 15 minutes of testing completion. Record inspection, sampling, and testing on the forms accepted with the QC plan and submit them within 48 hours of completion of each day of production and within 24 hours of 7-day modulus of rupture tests.

During the placement of RSC base, fabricate beams and test for the modulus of rupture:

1. At opening age
2. At 7 days after placing the first 30 cu yd
3. At least once every 130 cu yd
4. Within the final truckload

Opening age tests must be performed in the presence of the Engineer.

28-3.01D(3) Department Acceptance

The Department accepts RSC base based on compliance with the requirements shown in the following table:

RSC Base Requirements for Acceptance

Quality characteristic	Test method	Requirement
Modulus of rupture (min, psi at 7 days)	California Test 524	600

The Engineer adjust payment for RSC base for the 7-day modulus of rupture as follows:

1. Payment for a base with a modulus of rupture of 600 psi or greater is not adjusted.
2. Payment for a base with a modulus of rupture of less than 600 and greater than or equal to 550 psi is reduced by 5 percent.
3. Payment for a base with a modulus of rupture of less than 550 and greater than or equal to 500 psi is reduced by 10 percent.
4. Payment for a base with a modulus of rupture of less than 500 psi is not adjusted and no payment is made. Remove and replace this base.

Add to section 28-4.01C(1):

07-15-16

Submit a lean concrete base rapid setting QC plan.

Replace the headings and paragraphs in section 28-4.01D with:

07-15-16

28-4.01D Quality Assurance

28-4.01D(1) General

28-4.01D(1)(a) General

For compressive strength testing, prepare 6 cylinders under California Test 540. Test cylinders must be 6 by 12 inches. As an alternative to rodding, a vibrator may be used under California Test 524. Test cylinders under California Test 521 and perform 3 tests with each test consisting of 2 cylinders. The test result is the average from the 2 cylinders.

28-4.01D(1)(b) Field Qualification

Before placing lean concrete base rapid setting, you must perform field qualification testing and obtain authorization for each mix design. Retest and obtain authorization for changes to authorized mixed designs.

Proposed mix designs must be field qualified before you place the base represented by those mix designs. The technician performing the field test must hold current ACI certification as a Concrete Field Testing Technician-Grade I.

Notify the Engineer at least 5 days before field qualification. Perform field qualification within the job site or a location authorized.

Field qualification testing includes compressive strength, air content, and penetration or slump in compliance with the table titled "Lean Concrete Base Rapid Setting Requirements."

Field qualification must comply with the following:

1. Test for compressive strength at opening age and 7 days of age
2. At opening age, the compressive strength for each test must be at least 180 psi and the average strength for the 3 tests must be at least 200 psi
3. At 7 days age, the compressive strength for each test must be at least 600 psi and the average strength for the 3 tests must be at least 725 psi

28-4.01D(2) Quality Control

28-4.01D(2)(a) General

Reserved

28-4.01D(2)(b) Quality Control Manager

Reserved

28-4.01D(2)(c) Quality Control Testing

Test the base under the test methods and at the locations and frequencies shown in the following table:

LCB Rapid Setting Sampling Location and Testing Frequencies

Quality characteristic	Test method	Sampling location	Minimum sampling and testing frequency
Sand equivalent	ASTM D2419	Source	1 per 500 cu yd, minimum 1 per day of production
Aggregate gradation	ASTM C136		
Air content	ASTM C231	Job site	1 per 4 hours of placement work, plus one in the last hour of placement work
Penetration[a]	ASTM C360		
Slump[a]	ASTM C143		
Compressive strength	California Test 521		

[a]Test either penetration or slump

During placement of lean concrete base rapid setting, fabricate cylinders and test compressive strength for opening age and 7 days. Opening age tests must be performed in the presence of the Engineer.

28-4.01D(3) Department Acceptance

The Department accepts LCB rapid setting based on compliance with the requirement shown in the following table:

LCB Rapid Setting Requirements for Acceptance

Quality characteristic	Test method	Requirement
Compressive strength (min, psi at 7 days)	California Test 521[a]	725

[a]Cylinders made under California Test 540

Replace the 2nd and 3rd paragraphs in section 28-4.03A with:

07-15-16

Concrete paving operations with equipment not supported by the base may start before opening age. Do not open pavement for traffic before opening age of the LCB rapid setting.

Any other paving operations must start after the final set time of the base. The base must have a compressive strength of at least 450 psi under California Test 521 before:

1. Placing HMA
2. Placing other base material
3. Operating equipment on the base

Replace *Reserved* in section 28-5.01C with:

07-15-16

Submit a concrete base QC plan.

Replace the headings and paragraphs in section 28-5.01D(2) with:

07-15-16

28-5.01D(2) Quality Control

28-5.01D(2)(a) General

Reserved

28-5.01D(2)(b) Quality Control Manager

Reserved

28-5.01D(2)(c) Quality Control Testing

Test the concrete base under the test methods and at the locations and frequencies shown in the following table:

Concrete Base Sampling Location and Testing Frequencies

Quality characteristic	Test method	Sample location	Minimum testing frequency[a]
Cleanness value	California Test 227	Source	1 per 500 cubic yards but at least 1 per shift
Sand equivalent	California Test 217		
Aggregate gradation	California Test 202		
Air content	California Test 504	Job site	1 per 500 cu yd but at least 1 per shift
Yield	California Test 518		1 per shift
Slump or penetration	ASTM C143 or California Test 533		1 per 2 hours of placement
Density	California Test 518		1 per shift
Aggregate moisture meter calibration[b]	California Test 223 or California Test 226		1 per shift
Modulus of rupture	California Test 524		1 per 500 cu yd but at least 1 per shift

[a]Test at the most frequent interval.

[b]Check calibration of the plant moisture meter by comparing moisture meter readings with California Test 223 or California Test 226 test results.

28-5.01D(3) Department Acceptance

The Department accepts a concrete base based on compliance with the requirements shown in the following table:

Concrete Base Requirements for Acceptance

Quality characteristic	Test method	Requirement
Modulus of rupture (min, psi at 28 days)	California Test 523	570

Acceptance for the modulus of rupture is on a lot basis. The Department provides the molds and machines for the modulus of rupture acceptance testing. Provide any material and labor the Engineer may require for the testing.

^^

29 TREATED PERMEABLE BASES

07-15-16

Replace the headings and paragraphs in section 29-1.01 with:

07-15-16

29-1.01 GENERAL

29-1.01A Summary

Section 29-1 includes general specifications for constructing treated permeable bases.

29-1.01B Definitions

Reserved

29-1.01C Submittals

Submit a treated permeable base quality control plan.

29-1.01D Quality Assurance

29-1.01D(1) General

Reserved

29-1.01D(2) Quality Control

29-1.01D(2)(a) General

Reserved

29-1.01D(2)(b) Quality Control Plan

Reserved

29-1.01D(2)(c) Qualifications

Reserved

29-1.01D(3) Department Acceptance

Reserved

Replace the headings and paragraphs in section 29-2.01D with:

07-15-16

29-2.01D Quality Assurance

29-2.01D(1) General

The Engineer determines the asphalt content of the asphalt mixture under California Test 382. The bitumen ratio, pounds of asphalt per 100 lb of dry aggregate, must not vary more than 0.5 lb of asphalt above or below the quantity designated by the Engineer. Samples used to determine the bitumen ratio are obtained from trucks at the plant or from the mat behind the paver before rolling. If the sample is taken from the mat behind the paver, the bitumen ratio must not be less than the quantity designated by the Engineer, less 0.7 lb of asphalt per 100 lb of dry aggregate.

29-2.01D(2) Quality Control

29-2.01D(2)(a) General

Reserved

29-2.01D(2)(b) Quality Control Testing

ATPB quality control must include testing the quality characteristics at the frequencies shown in the following table:

QC Testing Frequencies

Quality characteristic	Test method	Sampling location	Minimum frequency
Gradation	California Test 202	Stockpiles or plant	1 for every 4 hours of production but at least one per day of placement
Cleanness value	California Test 227	Stockpiles or plant	1 for every 4 hours of production but at least one per day
Percentage of crushed particles	California Test 205	Stockpiles or plant	1 test before production and one every 5,000 cu yd thereafter
Los Angeles rattler loss at 500 rev	California Test 211	Stockpiles or plant	1 test before production and one every 5,000 cu yd thereafter
Film stripping	California Test 302	Plant	1 test before production and one every 5000 cu yd thereafter
Asphalt content of the asphalt mixture	California Test 382	Plant, transportation units, windrows, or roadway	1 for every 4 hours of production but at least one per day

29-2.01D(3) Department Acceptance

The Department accepts ATPB based on aggregate gradation, cleanness value, percent of crushed particles, Los Angeles rattler, film stripping and asphalt content requirements specified in section 29-2.02 and section 29-2.01D(1).

The Engineer takes samples for aggregate gradation, cleanness value, percent of crushed particles, Los Angeles rattler, and film stripping from the plant.

The Engineer takes samples for asphalt content of the asphalt mixture from any of the following locations:

1. Plant
2. Truck
3. Windrow
4. Roadbed

Replace the headings and paragraphs in section 29-3.01 with:

07-15-16

29-3.01 GENERAL

29-3.01A Summary

Section 29-3 includes specifications for constructing cement treated permeable bases.

29-3.01B Definitions

Reserved

29-3.01C Submittals

Reserved

29-3.01D Quality Assurance

29-3.01D(1) General

Reserved

29-3.01D(2) Quality Control

29-3.01D(2)(a) General

Reserved

29-3.01D(2)(b) Quality Control Testing

CTPB quality control must include testing the quality characteristics at the frequencies shown in the following table:

QC Testing Frequencies

Quality characteristic	Test method	Sampling location	Minimum frequency
Gradation	California Test 202	Stockpiles or plant	1 for every 4 hours of production but at least one per day of placement
Cleanness value	California Test 227	Stockpiles or plant	1 for every 4 hours of production but at least one per day
Los Angeles rattler loss at 500 rev	California Test 211	Stockpiles or plant	1 test before production and one every 5,000 cu yd thereafter
Soundness	California Test 214	Stockpiles or plant	1 test before production and one every 5,000 cu yd thereafter

29-3.01D(3) Department Acceptance

The Department accepts CTPB based on aggregate gradation, cleanness value, Los Angeles rattler and soundness requirements in section 29-3.02.

The Engineer takes samples for aggregate gradation, cleanness value, Los Angeles rattler and soundness from the plant.

Add to section 29-3.02A:

07-15-16

Water must comply with section 90-1.02D.

Replace *3rd* in the 2nd paragraph in section 29-3.03 with:

07-15-16

4th

^^

30 RECLAIMED PAVEMENT

07-15-16

Replace *section 30-1.01C(2)(c)* in the 1st paragraph of section 30-3.01C(2)(c) with:

07-15-16

section 30-1.01C(3)(c)

Replace the table in section 30-3.02A with:

07-15-16

FDR—Foamed Asphalt Quality Characteristic Requirements

Quality characteristic	Test method	Requirement
Moisture content before HMA paving	California Test 226	< 50% of OMC
Asphalt binder expansion ratio (min, %)	Note a	10
Asphalt binder half-life (seconds, min)		12
Gradation (%, passing) Sieve Size: 3 inch 2 inch 1-1/2 inch	California Test 202	 100 95–100 85–100
Moisture content Maximum Minimum	California Test 226	 OMC OMC - 2%
In-place wet density (lb/cu ft)	California Test 216	Report only
Relative compaction (min, %)	California Test 231	98
Indirect dry tensile strength (psi)[b]	California Test 371	90% of mix design value
Indirect wet tensile strength (psi)[b]	California Test 371	90% of mix design value
Tensile strength ratio (%)	California Test 371	90% of mix design value

[a]Test at the foaming temperature and percentage of foaming water by dry weight of FDR—foamed asphalt material designated in the mix design. To test asphalt binder expansion ratio and half-life, use a pail of known volume and a dipstick calibrated for the pail. From the inspection nozzle on the asphalt binder spray bar, inject foamed asphalt into the pail without exceeding the pail's capacity.
With the dipstick, immediately measure and record the level of foamed asphalt in the pail. Record the half-life in seconds from the time the injection of foamed asphalt in the pail is turned off to half the dip stick reading after peak. Calculate the expansion ratio as the volume of the foamed asphalt upon injection divided by the volume of the unfoamed asphalt binder.
[b]From material passing the 1-inch sieve, compact 6 specimens under California Test 304, Part 2. Cure the specimens at 100 °F for 72 hours and allow the specimens to cool to room temperature. Test 3 specimens for dry tensile strength under California Test 371. Test 3 specimens for wet tensile strength under California Test 371 after moisture conditioning.

Replace *section 30-4.01D(3)* in the 2nd paragraph of section 30-4.01D(1) with:

07-15-16

section 30-4.01D(4)

Replace *section 30-4.01D(1)(a)* in the table in section 30-4.02A with:

07-15-16

section 30-4.01D(2)

^^

DIVISION V SURFACINGS AND PAVEMENTS

37 BITUMINOUS SEALS

07-15-16

Replace section 37 with:

07-15-16

37 SEAL COATS

37-1 GENERAL

37-1.01 GENERAL

37-1.01A Summary

Section 37-1 includes general specifications for applying seal coats.

37-1.01B Definitions

Reserved

37-1.01C Submittals

At least 10 days before the preconstruction meeting submit a list of participants in the preconstruction meeting. Provide each participant's name, employer, title, and role in the production and placement of the seal coats.

At least 10 days before starting seal coat activities, submit the names of the authorized laboratories for quality control testing.

For each delivery of asphalt binder or asphaltic emulsion to the job site, submit a certificate of compliance and a copy of the specified test results.

For a seal coat that uses crumb rubber modifier, submit a Crumb Rubber Usage Report form monthly and at the end of project.

37-1.01D Quality Assurance

37-1.01D(1) General

For aggregate testing, quality control laboratories must be in compliance with the Department's Independent Assurance Program to be an authorized laboratory. Quality control personnel must be qualified under the Department's Independent Assurance Program.

For emulsion testing, quality control laboratories must participate in the AASHTO Material's Reference Laboratory proficiency sample program.

37-1.01D(2) Preconstruction Meeting

Hold a preconstruction meeting within 5 days before start of seal coat work at a mutually agreed time and place with the Engineer and your:

1. Project superintendent
2. Project foreman
3. Traffic control foreman

Make arrangements for the conference facility. Preconstruction meeting participants must sign an attendance sheet provided by the Engineer. Be prepared to discuss:

1. Quality control testing
2. Acceptance testing
3. Seal coat placement
4. Proposed application rates for asphaltic emulsion or asphalt binder and aggregate.
5. Training on placement methods
6. Checklist of items for proper placement
7. Unique issues specific to the project, including:
    - 7.1. Weather
    - 7.2. Alignment and geometrics
    - 7.3. Traffic control requirements

7.4. Haul distances
7.5. Presence and absence of shaded areas
7.6. Any other local conditions
8. Contingency plan for material deliveries, equipment breakdowns, and traffic handling
9. Who in the field has authority to adjust application rates and how adjustments will be documented
10. Schedule of sweepings

37-1.02 MATERIALS

Not Used

37-1.03 CONSTRUCTION

37-1.03A General

If seal coat activities affect access to public parking, residential property, or commercial property, post signs at 100-foot intervals on the affected streets. Signs must display *No Parking – Tow Away*. Signs must state the dates and hours parking or access will be restricted. Notify residents, businesses, and local agencies at least 24 hours before starting activities. The notice must:

1. Describe the work to be performed
2. Detail streets and limits of activities
3. Indicate dates and work hours
4. Be authorized

Asphaltic emulsion or asphalt binder for seal coats may be reheated if necessary. After loading the asphaltic emulsion or asphalt binder into a truck for transport to the job site, do not heat asphaltic emulsion above 160 degrees F and asphalt rubber binder above 425 degrees F. During reheating, circulate or agitate the asphaltic emulsion or asphalt binder to prevent localized overheating.

Except for fog seals, apply quick setting Grade 1 asphaltic emulsions at a temperature from 75 to 130 degrees F and apply quick setting Grade 2 asphaltic emulsions at a temperature from 110 to 185 degrees F.

You determine the application rates for asphaltic emulsion or asphalt binder and aggregate and the Engineer authorizes the application rates.

37-1.03B Equipment

A self-propelled distributor truck for applying asphaltic emulsion or asphalt binder must be equipped with:

1. Pressure-type system with insulated tanks with circulating unit
2. Spray bars:
   2.1. With minimum length of 9 feet and full-circulating type
   2.2. With full-circulating-type extensions if needed to cover a greater width
   2.3. Adjustable to allow positioning at various heights above the surface to be treated
   2.4. Operated by levers such that 1 or all valves may be quickly opened or closed in one operation
3. Devices and charts to provide for accurate and rapid determination and control of asphaltic emulsion or asphalt binder quantities being applied. Include an auxiliary wheel type meter that registers:
   3.1. Speed in ft/min
   3.2. Trip by count
   3.3. Total distance in feet
4. Distribution system:
   4.1. Capable of producing a uniform application of asphaltic emulsion or asphalt binder in controlled quantities ranging from 0.02 to 1 gal/sq yd of surface and at a pressure ranging from 25 to 75 psi
   4.2. Pumps that spray asphaltic emulsion or asphalt binder within 0.02 gal/sq yd of the set rate
   4.3. With a hose and nozzle for application of asphaltic emulsion to areas inaccessible to the spray bar
   4.4. With pressure gauges and a thermometer for determining temperatures of the asphaltic emulsion or asphalt binder

You may use cab-controlled valves for the application of asphaltic emulsion or asphalt binder. The valves controlling the flow from nozzles must act positively to provide a uniform unbroken application of asphaltic emulsion or asphalt binder.

Maintain distributor and storage tanks at all times to prevent dripping.

37-1.04 PAYMENT

Not Used

37-2 CHIP SEALS

37-2.01 GENERAL

37-2.01A General

37-2.01A(1) Summary

Section 37-2.01 includes general specifications for applying chip seals.

37-2.01A(2) Definitions

Reserved

37-2.01A(3) Submittals

At least 15 days before starting placement of chip seal, submit:

1. Samples for:
   1.1. Asphaltic emulsion chip seal, two 1-quart wide mouth plastic containers with screw top lid of asphaltic emulsion
   1.2. Polymer modified asphaltic emulsion chip seal, two 1-quart wide mouth plastic containers with screw top lid of polymer modified asphaltic emulsion
   1.3. Asphalt rubber binder chip seal, two 1-quart cans of base asphalt binder
   1.4. Asphalt rubber binder chip seal, five 1-quart cans of asphalt rubber binder
2. Asphaltic emulsion, polymer modified asphaltic emulsion, asphalt binder or asphalt rubber binder data as follows:
   2.1. Supplier and Type/Grade of asphaltic emulsion or asphalt binder
   2.2. Type of modifier used including polymer or crumb rubber or both
   2.3. Percent of crumb rubber, if used as modifier
   2.4. Copy of the specified test results for asphaltic emulsion or asphalt binder
3. 50 lb of uncoated aggregate
4. Aggregate test results for the following:
   4.1. Gradation
   4.2. Los Angeles Rattler
   4.3. Percent of crushed particles
   4.4. Flat and elongated particles
   4.5. Film stripping
   4.6. Cleanness value
   4.7. Durability
5. Vialit test results

Submit quality control test results for the quality characteristics within the reporting times allowance after sampling shown in the following table:

Quality Control Test Result Reporting

Quality characteristic	Maximum reporting time allowance
Los Angeles Rattler loss (max, %)	48 hours
Percent of crushed particles (min, %)	48 hours
Flat and elongated particles (max by weight at 3:1, %)	48 hours
Film stripping (max, %)	48 hours
Durability (min)	48 hours
Gradation (percentage passing)	24 hours
Cleanness value (min)	24 hours
Asphaltic emulsion spread rate (gal/sq yd)	24 hours

Within 3 days after taking asphaltic emulsion or asphalt binder quality control samples, submit the authorized laboratory's test results.

37-2.01A(4) Quality Assurance

37-2.01A(4)(a) General

Reserved

37-2.01A(4)(b) Quality Control

37-2.01A(4)(b)(i) General

Reserved

37-2.01A(4)(b)(ii) Aggregate

All tests must be performed on uncoated aggregate except for film stripping which must be performed on precoated aggregate.

For aggregate, the authorized laboratory must perform sampling and testing at the specified frequency and location for the following quality characteristics:

Aggregate Quality Control Requirements

Quality characteristic	Test method	Minimum sampling and testing frequency	Location of sampling
Los Angeles Rattler loss (max, %) At 100 revolutions At 500 revolutions	California Test 211	1st day of production	See California Test 125
Percent of crushed particles Coarse aggregate (min, %) One-fractured face Two-fractured faces Fine aggregate (min, %) (Passing No. 4 sieve and retained on No. 8 sieve) One fractured face	AASHTO T 335	1st day of production	See California Test 125
Flat and elongated particles (max by weight at 3:1, %)	ASTM D4791	1st day of production	See California Test 125
Film stripping (max, %)	California Test 302	1st day of production	See California Test 125
Durability (min)	California Test 229	1st day of production	See California Test 125
Gradation (% passing)	California Test 202	2 per day	See California Test 125
Cleanness value (min)	California Test 227	2 per day	See California Test 125

37-2.01A(4)(b)(iii) Chip Seals

For a chip seal, the authorized laboratory must perform sampling and testing at the specified frequency and location for the following quality characteristics:

Chip Seal Quality Control Requirements

Quality characteristic	Test method	Minimum sampling and testing frequency	Location of sampling
Asphaltic emulsion binder spread rate (gal/sq yd)	California Test 339	1 per day per distributor truck	Pavement surface

37-2.01A(4)(c) Department Acceptance

Department Acceptance shall not apply to identified areas where the existing surfacing before application of chip seal, contains defective areas as determined by the Engineer and Contractor. At least 7 days

before starting placement of the chip seal, the Contractor shall submit a written list of existing defective areas, identifying the lane direction, lane number, starting and ending highway post mile locations, and defect type. The Engineer must agree on which of the identified areas are defective.

Defective areas are defined as one of the following:

1. Areas with wheel path rutting in excess of 3/8 inch when measured by placing a straightedge 12 feet long on the finished surface perpendicular to the center line and measuring the vertical distance between the finished surface and the lower edge of the straightedge
2. Areas exhibiting flushing

For a chip seal, acceptance is based on visual inspection for the following:

1. Uniform surface texture
2. Raveling, which consists of the separation of the aggregate from the asphaltic emulsion or asphalt binder
3. Flushing, which consists of the occurrence of a film of asphaltic material on the surface of the chip seal.
4. Streaking, which consists of alternating longitudinal bands of asphaltic emulsion or asphalt binder without uniform aggregate retention, approximately parallel with the lane line.

Areas of raveling, flushing or streaking that are greater than 0.5 sq ft shall be considered defective and must be repaired.

Raveling and streaking must be repaired by placing an additional layer of chip seal over the defective area.

For asphaltic emulsion or asphalt binder, acceptance is based on the Department's sampling and testing for compliance with the requirements for the quality characteristics specified.

For aggregate, acceptance is based on the Department's sampling and testing for compliance with the requirements shown in the following table:

Chip Seal Aggregate Acceptance Criteria

Quality characteristic	Test method	Requirements
Los Angeles Rattler loss (max, %) At 100 revolutions At 500 revolutions	California Test 211	 10 40
Percent of crushed particles: Coarse aggregate (min, %) One-fractured face Two-fractured faces Fine aggregate (min, %) (Passing No. 4 sieve and retained on No. 8 sieve) One fractured face	AASHTO T 335	 95 90 70
Flat and elongated particles (max by weight at 3:1, %)	ASTM D4791	10
Film stripping (max, %)	California Test 302	25
Durability (min)	California Test 229	52
Gradation (% passing by weight)	California Test 202	Aggregate Gradation table shown under Materials for the chip seal type specified.
Cleanness value (min)	California Test 227	80

If test results for the aggregate gradation do not comply with specifications, you may remove the chip seal represented by these tests or request that it remain in place with a payment deduction. The deduction is $1.75 per ton for the aggregate represented by the test results.

If test results for aggregate cleanness value do not comply with the specifications, you may remove the chip seal represented by these tests or you may request that the chip seal remain in place with a pay deduction corresponding to the cleanness value shown in the following table:

Chip Seal Cleanness Value Deductions

Cleanness value	Deduction
80 or over	None
79	$2.00 /ton
77–78	$4.00 /ton
75–76	$6.00 /ton

If the aggregate cleanness value is less than 75, remove the chip seal.

37-2.01B Materials

37-2.01B(1) General

Reserved

37-2.01B(2) Asphaltic Emulsions and Asphalt Binders

Reserved

37-2.01B(3) Aggregate

37-2.01B(3)(a) General

Aggregate must be broken stone, crushed gravel, or both.

Aggregate must comply with the requirements shown in the following table:

Chip Seal Aggregate Requirements

Quality characteristic	Test method	Requirements
Los Angeles Rattler loss (max, %) At 100 revolutions At 500 revolutions	California Test 211	 10 40
Percent of crushed particles Coarse aggregate (min, %) One-fractured face Two-fractured faces Fine aggregate (min, %) (Passing No. 4 sieve and retained on No. 8 sieve) One fractured face	AASHTO T 335	 95 90 70
Flat and elongated particles (max by weight at 3:1, %)	ASTM D4791	10
Film stripping (max, %)	California Test 302	25
Durability (min)	California Test 229	52
Gradation (% passing by weight)	California Test 202	Aggregate Gradation table shown under Materials for the chip seal type specified.
Cleanness value (min)	California Test 227	80

The authorized laboratory must conduct the Vialit test using the proposed asphaltic emulsion or asphalt binder and aggregate for compliance with the requirements shown in the following table:

Chip Retention Requirements

Quality characteristic	Test method	Requirement
Chip retention (%)	Vialit test method for aggregate in chip seals, French chip (Modified)[a]	95

[a]The asphaltic emulsion or asphalt binder must be within the field placement temperature range and application rate during specimen preparation. For asphalt binder cure the specimen for first 2 hours at 100 °F.

37-2.01B(3)(b) Precoated Aggregate

Precoating of aggregate must be performed at a central mixing plant. The plant must be authorized under the Department's *MPQP*.

When precoating aggregate, do not recombine fine materials collected in dust control systems.

Precoated aggregate must be preheated from 260 to 325 degrees F. Coat with any of the asphalts specified in the table titled "Performance Graded Asphalt Binder" in section 92. The asphalt must be from 0.5 to 1.0 percent by weight of dry aggregate. You determine the exact asphalt rate for precoating of aggregate.

Do not stockpile precoated aggregate.

37-2.01C Construction

37-2.01C(1) General

For chip seals on 2-lane, 2-way roadways, place a W8-7 (LOOSE GRAVEL) sign and a W13-1 (35) plaque at 2,000-foot maximum intervals along each side of the traveled way where aggregate is spread on a traffic lane and at public roads or streets entering the chip seal area. Place the 1st W8-7 sign in each direction where traffic first encounters the loose aggregate, regardless of which lane the aggregate is spread on. A W13-1 (35) plaque is not required where the posted speed limit is less than 40 mph.

For chip seals on freeways, expressways, and multilane conventional highways, place a W8-7, (LOOSE GRAVEL) sign and a W13-1 (35) plaque at 2,000-foot maximum intervals along the outside edge of the traveled way nearest to the lane worked on, at on ramps, and at public roads or streets entering the chip seal area. Place the 1st W8-7 sign where the aggregate starts with respect to the direction of travel on that lane. A W13-1 (35) plaque is not required where the posted speed limit is less than 40 mph.

Pilot cars must have cellular or radio contact with other pilot cars and personnel in the work zone. The maximum speed of the pilot cars convoying or controlling traffic through the traffic control zone must be 15 mph on 2-lane, two-way highways and 25 mph on multilane divided and undivided highways. Pilot cars must only use traffic lanes open to traffic.

On the days that closures are not allowed, you may use a moving closure to maintain the seal coat surface. The moving closure is only allowed during daylight hours when traffic will be the least inconvenienced and delayed. The Engineer determines the hours for the moving closure.

Maintain signs in place at each location until the final sweeping of the chip seal surface for that location is complete. Signs may be set on temporary portable supports with the W13-1 sign below the W8-7 sign or on barricades with the W13-1 sign alternating with the W8-7 sign.

Schedule chip seal activities so that the chip seals are placed on both lanes of the traveled way each work shift.

If traffic is routed over a surface where a chip seal application is intended, the chip seal must not be applied to more than half the width of the traveled way at a time, and the remaining width must be kept free of obstructions and open to traffic until the previously applied width is ready for traffic use.

Wherever maintenance sweeping of the chip seal surface is complete, place permanent traffic stripes and pavement markings within 10 days.

If you fail to place the permanent traffic stripes and pavement markings within the specified time, the Department withholds 50 percent of the estimated value of the chip seal work completed that has not received permanent traffic stripes and pavement markings.

37-2.01C(2) Equipment

Equipment for chip seals must include and comply with the following:

1. Aggregate haul trucks must have:
   1.1. Tailgate that discharge aggregate
   1.2. Device to lock onto the rear aggregate spreader hitch
   1.3. Dump bed that will not push down on the spreader when fully raised
   1.4. Dump bed that will not spill aggregate on the roadway when transferred to the spreader hopper
   1.5. Tarpaulin to cover precoated aggregate when haul distance exceeds 30 minutes or ambient temperature is less than 65 degrees F
2. Self-propelled aggregate spreaders must have:
   2.1. Aggregate hopper in the rear
   2.2. Belt conveyor that carries the aggregate to the front
   2.3. Spreading hopper capable of providing a uniform aggregate spread rate over the entire width of the traffic lane in 1 application.
3. Self-propelled power brooms must:
   3.1. Not be steel-tined brooms on emulsion chip seals
   3.2. Be capable of removing loose aggregate adjacent to barriers that prevent aggregate from being swept off the roadway, including curbs, gutters, dikes, berms, and railings
4. Pneumatic or foam filled rubber tired rollers must:
   4.1. Be an oscillating type at least 4 feet wide
   4.2. Be self-propelled and reversible
   4.3. Have tires of equal size, diameter, type, and ply
   4.4. Carry at least 3,000 lbs of load on each wheel
   4.5 Have tires with an air pressure of 100 ± 5 psi or be foam filled

37-2.01C(3) Surface Preparation

Before applying chip seals, cover manholes, valve and monument covers, grates, or other exposed facilities located within the area of application, using a plastic or oil resistant construction paper secured by tape or adhesive to the facility being covered. Reference the covered facilities with enough control points to relocate the facilities after the application of the chip seal.

Immediately before applying chip seals, clean the surface to receive a chip seal by removing any extraneous material affecting adhesion of the chip seal with the existing surface and drying. Use self-propelled power brooms to clean the existing pavement.

37-2.01C(4) Placement

37-2.01C(4)(a) General

Schedule the operations so that chip seals are placed on both lanes of the traveled way each work shift. At the end of the work shift, the end of the chip seals on both lanes must generally match.

37-2.01C(4)(b) Applying Asphaltic Emulsions or Asphalt Binders

Prevent spraying on existing pavement not intended for chip seals or on previously applied chip seals using a material such as building paper. Remove the material after use.

Align longitudinal joints between chip seal applications with designated traffic lanes.

For asphaltic emulsion or asphalt binder, overlap longitudinal joints by not more than 4 inches. You may overlap longitudinal joints up to 8 inches if authorized.

For areas not accessible to a truck distributor bar apply:

1. Asphaltic emulsions by hand spraying
2. Asphalt binders with a squeegee or other authorized means

You may overlap the asphaltic emulsion or asphalt binder applications before the application of aggregate at longitudinal joints.

Do not apply the asphaltic emulsion or asphalt binder unless there is sufficient aggregate at the job site to cover the asphaltic emulsion or asphalt binder.

Discontinue application of asphaltic emulsion or asphalt binder early enough to comply with lane closure requirements. Apply to 1 lane at a time and cover the lane width entirely in 1 operation.

37-2.01C(4)(c) Spreading Aggregates

37-2.01C(4)(c)(i) General

Prevent vehicles from driving on asphaltic emulsion or asphalt binder before spreading aggregate.

Spread aggregate within 10 percent of your determined rate.

Spread aggregate at a uniform rate over the full lane width in 1 application. Apply to 1 lane at a time.

Sweep excess aggregate at joints before spreading adjacent aggregate.

Operate the spreader at speeds slow enough to prevent aggregate from rolling over after dropping.

If the spreader is not moving, aggregate must not drop. If you stop spreading and aggregate drops, remove the excess aggregate before resuming activities.

37-2.01C(4)(c)(ii) Precoated Aggregate Application

During transit, cover precoated aggregate with tarpaulins if the ambient air temperature is below 65 degrees F or the haul time exceeds 30 minutes.

When applied, precoated aggregate must be from 225 to 325 degrees F.

37-2.01C(4)(d) Finishing

37-2.01C(4)(d)(i) General

Remove piles, ridges, or unevenly distributed aggregate. Repair permanent ridges, bumps, streaks or depressions in the finished surface. Spread additional aggregate and roll if aggregate is picked up by rollers or vehicles.

Chip seal joints between adjacent applications of a chip seal must be smooth, straight, uniform, and completely covered.

A coverage is 1 roller movement over the entire width of lane. A pass is 1 roller movement parallel to the chip seal application in either direction. Overlapping passes are part of the coverage being made and are not part of a subsequent coverage. Do not start a new coverage until completing the previous coverage.

Before opening to traffic, finish the chip seals in the following sequence:

1. Perform initial rolling consisting of 1 coverage with a pneumatic-tired roller
2. Perform final rolling consisting of 2 coverages with a pneumatic-tired roller
3. Sweep excess aggregate from the roadway and adjacent abutting areas
4. Apply a flush coat if specified
5. Remove covers from the facilities

37-2.01C(4)(d)(ii) Traffic Control With Pilot Car

For 2-lane 2-way roadways under 1-way traffic control, upon completion of final rolling, traffic must be controlled with pilot cars and routed over the new chip seal for a period of 2 to 4 hours before opening the lane to traffic not controlled with pilot cars.

For multilane roadways, when traffic is controlled with pilot cars, a maximum of 1 lane in the direction of travel must be open to traffic. Traffic must be controlled with pilot cars and be routed on the new chip seal surface of the lane for a minimum of 2 hours after completion of the initial sweeping and before opening the lane to traffic not controlled with pilot cars. Once traffic controlled with pilot cars is routed over the chip seal at a particular location, continuous control must be maintained at that location until the chip seal placement and sweeping on adjacent lanes to receive a chip seal is completed.

37-2.01C(4)(d)(iii) Sweeping

Sweeping must be performed after the chip seal has set and there is no damage or dislodging of aggregate from the chip seal surface. As a minimum, sweeping is required at the following times:

1. On 2-lane 2-way roadways, from 2 to 4 hours after traffic, controlled with pilot cars, has been routed on the chip seal
2. On multilane roadways, from 2 to 4 hours after aggregate have been placed
3. In addition to previous sweeping, perform final sweeping immediately before opening any lane to public traffic, not controlled with pilot cars

37-2.01C(4)(d)(iv) Excess Aggregate

Dispose of excess aggregate. If ordered, salvaging and stockpiling of excess aggregate is change order work.

37-2.01C(4)(e) Chip Seal Maintenance

Perform sweeping on the morning following the application of aggregate on any lane that has been open to traffic not controlled with pilot cars and before starting any other activities.

Chip seal surfaces must be maintained for 4 consecutive days from the day aggregate is applied. Maintenance must include sweeping to maintain a surface free of loose aggregate and to prevent formation of corrugations. Sweeping must not dislodge aggregate set in asphaltic emulsion or asphalt binder.

After 4 consecutive days, excess aggregate must be removed from the paved areas.

37-2.01D Payment

If there is no bid item for traffic control system, furnishing and using a pilot car is included in the various items of the work involved in applying the chip seal.

The payment quantity for precoated aggregate is the weight measured after the aggregate is preheated and precoated with asphalt binder.

If recorded batch weights are printed automatically, the payment quantity for aggregate is the weight determined from the printed batch weights if:

1. Total weight for the precoated aggregate per batch is printed
2. Total asphalt binder weight per batch is printed
3. Zero tolerance weight is printed before weighing the first batch and after weighing the last batch for each truckload
4. Time, date, mix number, load number, and truck identification are correlated with a load slip
5. Copy of the recorded batch weights is certified by a licensed weighmaster

37-2.02 ASPHALTIC EMULSION CHIP SEALS

37-2.02A General

37-2.02A(1) Summary

Section 37-2.02 includes specifications for applying asphaltic emulsion chip seals. An asphaltic emulsion chip seal includes applying an asphaltic emulsion, followed by aggregate, and then a flush coat.

A double asphaltic emulsion chip seal is the application of an asphaltic emulsion followed by aggregate, applied twice in sequence and then a flush coat.

37-2.02A(2) Definitions

Reserved

37-2.02A(3) Submittals

Immediately after sampling, submit two 1-quart plastic containers of asphaltic emulsion taken in the presence of the Engineer. Samples must be submitted in insulated shipping container.

37-2.02A(4) Quality Assurance

37-2.02A(4)(a) General

Reserved

37-2.02A(4)(b) Quality Control

37-2.02A(4)(b)(i) General

Reserved

37-2.02A(4)(b)(ii) Asphaltic Emulsions

Circulate asphaltic emulsion in the distributor truck before sampling. Take samples from the distributor truck at mid load or from a sampling tap or thief. Before taking samples, draw and dispose of 1 gallon. In the presence of the Engineer, take two 1-quart samples in a plastic container with lined sealed lid for acceptance testing.

For asphaltic emulsion, the authorized laboratory must perform quality control sampling and testing at the specified frequency and location for the following quality characteristics:

Asphaltic Emulsion

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling location
Saybolt Furol Viscosity, at 25 °C (Saybolt Furol seconds)	AASHTO T 59	Minimum 1 per day per delivery truck	Distributor truck
Sieve Test (%)			
Storage stability, 1 day (%)			
Residue by distillation (%)			
Particle charge[a]			
Tests on Residue from Distillation Test:			
Penetration, 25 °C	AASHTO T 49	Minimum 1 per day per delivery truck	Distributor truck
Ductility	AASHTO T 51		
Solubility in trichloroethylene	AASHTO T 44		

[a]If the result of the particle charge is inconclusive, the asphaltic emulsion must be tested for pH under ASTM E70. Grade QS1h asphaltic emulsion must have a minimum pH of 7.3. Grade CQS1h asphaltic emulsion must have a maximum pH of 6.7.

37-2.02A(4)(c) Department Acceptance

Aggregate acceptance is based on the Department's sampling and testing for compliance with the requirements shown in the following table:

Aggregate Gradation Acceptance Criteria

Quality characteristic	Test method	Requirement		
Gradation (% passing by weight) Sieve size:	California Test 202	3/8"	5/16"	1/4"
3/4"		--	--	--
1/2"		100	--	--
3/8"		85–100	100	100
No. 4		0–15	0–50	60–85
No. 8		0–5	0–15	0–25
No. 16		--	0–5	0–5
No. 30		--	0–3	0–3
No. 200		0–2	0–2	0–2

37-2.02B Materials

37-2.02B(1) General

Reserved

37-2.02B(2) Asphaltic Emulsions

Reserved

37-2.02B(3) Aggregate

Aggregate gradation for an asphaltic emulsion chip seal must comply with the requirements shown in the following table:

Asphaltic Emulsion Chip Seal Aggregate Gradation

Quality characteristic	Test method	Requirement		
Gradation (% passing by weight) Sieve size:	California Test 202	3/8"	5/16"	1/4"
3/4"		--	--	--
1/2"		100	--	--
3/8"		85–100	100	100
No. 4		0–15	0–50	60–85
No. 8		0–5	0–15	0–25
No. 16		--	0–5	0–5
No. 30		--	0–3	0–3
No. 200		0–2	0–2	0–2

37-2.02C Construction

37-2.02C(1) General

Reserved

37-2.02C(2) Asphaltic Emulsions

Asphaltic emulsions must be applied within the application rate ranges shown in the following table:

Asphaltic Emulsion Application Rates

Aggregate gradation	Application rate range (gal/sq yd)
3/8"	0.30–0.45
5/16"	0.25–0.35
1/4"	0.20–0.30

For double asphaltic emulsion chip seals, the asphaltic emulsions must be applied within the application rates shown in the following table:

Asphaltic Emulsion Application Rates

Double chip seals	Application rate range (gal/sq yd)
1st application 2nd application	0.30–0.45 0.20–0.30

When applied, the temperature of the asphaltic emulsions must be from 130 to 180 degrees F.

Apply asphaltic emulsions when the ambient air temperature is from 65 to 110 degrees F and the pavement surface temperature is at least 80 degrees F.

Do not apply asphaltic emulsions when weather forecasts predict the ambient air temperature will fall below 39 degrees F within 24 hours after application.

37-2.02C(3) Spreading Aggregates

Aggregate must be spread within the spread rate ranges shown in the following table:

Aggregate Spread Rates

Aggregate gradation	Spread rate range (lb/sq yd)
3/8"	20–30
5/16"	16–25
1/4"	12–20

For double asphaltic emulsion chip seals, aggregate must be spread within the spread rate ranges shown in the following table:

Aggregate Spread Rates

Double chip seal	Spread rate range (lb/sq yd)
1st application	23–30
2nd application	12–20

Remove excess aggregate on the 1st application before the 2nd application of asphaltic emulsion.

You may stockpile aggregate for asphaltic emulsion chip seals if you prevent contamination. Aggregate must have a damp surface at spreading. If water visibly separates from the aggregate, do not spread. You may re-dampen aggregate in the delivery vehicle.

Spread aggregate before an asphaltic emulsion sets or breaks.

Do not spread aggregate more than 2,500 feet ahead of the completed initial rolling.

37-2.02D Payment

Not Used

37-2.03 POLYMER MODIFIED ASPHALTIC EMULSION CHIP SEALS

37-2.03A General

37-2.03A(1) Summary

Section 37-2.03 includes specifications for applying polymer modified asphaltic emulsion chip seals. A polymer modified asphaltic emulsion chip seal includes applying a polymer modified asphaltic emulsion, followed by aggregate, and then a flush coat.

A double polymer modified asphaltic emulsion chip seal is the application of a polymer modified asphaltic emulsion followed by aggregate, applied twice in sequence and then a flush coat.

37-2.03A(2) Definitions

Reserved

37-2.03A(3) Submittals

Immediately after sampling, submit two 1-quart cans of polymer modified asphaltic emulsion taken in the presence of the Engineer. A sample must be submitted in an insulated shipping container.

37-2.03A(4) Quality Assurance

37-2.03A(4)(a) General

Reserved

37-2.03A(4)(b) Quality Control

37-2.03A(4)(b)(i) General

Reserved

37-2.03A(4)(b)(ii) Polymer Modified Asphaltic Emulsions

Circulate polymer modified asphaltic emulsions in the distributor truck before sampling. Take samples from the distributor truck at mid load or from a sampling tap or thief. Before taking samples, draw and dispose of 1 gallon. In the presence of the Engineer, take two 1-quart samples for acceptance testing.

For polymer modified asphaltic emulsions, the authorized laboratory must perform quality control sampling and testing at the specified frequency and location for the following quality characteristics:

Polymer Modified Asphaltic Emulsion

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling location
Saybolt Furol Viscosity, at 50 °C (Saybolt Furol seconds)	AASHTO T 59	Minimum 1 per day per delivery truck	Distributor truck
Settlement, 5 days (max, %)			
Storage stability test, 1 day (max, %)			
Sieve test (max, %)			
Demulsibility (min, %)			
Particle charge			
Ash content (max, %)	ASTM D3723		
Residue by evaporation (min, %)	California Test 331		
Tests on residue from evaporation test:			
Penetration, 25 °C	AASHTO T 49	Minimum 1 per day per delivery truck	Distributor truck
Penetration, 4 °C, 200g for 60 seconds	AASHTO T 49		
Ductility, 25 °C (min, mm)	AASHTO T 51		
Torsional recovery (min, %)	California Test 332		
Ring and Ball Softening Point (min, °F)	AASHTO T 53		

37-2.03A(4)(c) Department Acceptance

Aggregate acceptance is based on the Department's sampling and testing for compliance with the requirements shown in the following table:

Aggregate Gradation Acceptance Criteria

Quality characteristic	Test method	Requirement		
Gradation (% passing by weight) Sieve size:	California Test 202	3/8"	5/16"	1/4"
3/4"		--	--	--
1/2"		100	--	--
3/8"		85–100	100	100
No. 4		0–15	0–50	60–85
No. 8		0–5	0–15	0–25
No. 16		--	0–5	0–5
No. 30		--	0–3	0–3
No. 200		0–2	0–2	0–2

37-2.03B Materials

37-2.03B(1) General

Reserved

37-2.03B(2) Polymer Modified Asphaltic Emulsions

A polymer modified asphaltic emulsion must include elastomeric polymer.

A polymer modified asphaltic emulsion must be Grade PMRS2, PMRS2h, PMCRS2, or PMCRS2h. Polymer content in percent by weight does not apply.

A polymer modified asphaltic emulsion must comply with section 94 and the quality characteristic requirements in the following table:

Polymeric Asphaltic Emulsion

Quality characteristic	Test method	Requirement
Penetration, 4 °C, 200g for 60 seconds (min)	AASHTO T 49	6
Ring and Ball Softening Point (min, °F)	AASHTO T 53	135

37-2.03B(3) Aggregate

The aggregate gradation for a polymer modified asphaltic emulsion chip seal must comply with the requirements shown in the following table:

Asphaltic Emulsion Chip Seal Aggregate Gradation

Quality characteristic	Test method	Requirement		
Gradation (% passing by weight) Sieve Size	California Test 202	3/8"	5/16"	1/4"
3/4"		--	--	--
1/2"		100	--	--
3/8"		85–100	100	100
No. 4		0–15	0–50	60–85
No. 8		0–5	0–15	0–25
No. 16		--	0–5	0–5
No. 30		--	0–3	0–3
No. 200		0–2	0–2	0–2

37-2.03C Construction

Polymer modified asphaltic emulsions must be applied within the application rate ranges shown in the following table:

Polymer Modified Asphaltic Emulsion Application Rates

Aggregate gradation	Application rate range (gal/sq yd)
3/8"	0.30–0.45
5/16"	0.25–0.35
1/4"	0.20–0.30

For double polymer modified asphaltic emulsion chip seals, polymer modified asphaltic emulsions must be applied within the application rates shown in the following table:

Polymer Modified Asphaltic Emulsion Application Rates

Double application	Application rate range (gal/sq yd)
1st application 2nd application	0.30–0.45 0.20–0.30

Apply polymer modified asphaltic emulsions when the ambient air temperature is from 60 to 105 degrees F and the pavement surface temperature is at least 80 degrees F.

Do not apply polymer modified asphaltic emulsions when weather forecasts predict the ambient air temperature will fall below 39 degrees F within 24 hours after application.

Aggregate must be spread within the spread rate ranges shown in the following table:

Aggregate Spread Rates

Chip seal type	Spread rate range (lb/sq yd)
3/8"	20–30
5/16"	16–25
1/4"	12–20

For double chip seals, aggregate must be spread within spread rate ranges shown in the following table:

Aggregate Spread Rates

Double application	Spread rate range (lb/sq yd)
1st application	23–30
2nd application	12–20

Remove excess aggregate on the 1st application before the 2nd application of asphaltic emulsion.

You may stockpile aggregate for the polymer modified asphaltic emulsion chip seals if you prevent contamination. Aggregate must have damp surfaces at spreading. If water visibly separates from the aggregate, do not spread. You may redampen aggregate in the delivery vehicle.

Spread aggregate before the polymer modified asphaltic emulsion sets or breaks.

Do not spread aggregate more than 2,500 feet ahead of the completed initial rolling.

37-2.03D Payment

Not Used

37-2.04 ASPHALT RUBBER BINDER CHIP SEALS

37-2.04A General

37-2.04A(1) Summary

Section 37-2.04 includes specifications for applying asphalt rubber binder chip seals.

An asphalt rubber binder chip seal consists of applying asphalt rubber binder followed by heated aggregate precoated with asphalt binder followed by a flush coat.

37-2.04A(2) Definitions

crumb rubber modifier: Combination of ground or granulated high natural scrap tire crumb rubber and scrap tire crumb rubber derived from waste tires described in Pub Res Code § 42703.

descending viscosity reading: Subsequent viscosity reading at least 5 percent lower than the previous viscosity reading.

high natural scrap tire crumb rubber: Material containing 40 to 48 percent natural rubber.

scrap tire crumb rubber: Any combination of vehicle tires or tire buffing.

37-2.04A(3) Submittals

At least 5 business days before use, submit the permit issued by the local air district for asphalt rubber binder field blending equipment and application equipment. If an air quality permit is not required by the local air district for producing asphalt rubber binder, submit verification from the local air district that an air quality permit is not required.

For each delivery of asphalt rubber binder ingredients to the job site, submit a certificate of compliance with a copy of the specified test results.

Submit a certified volume or weight slip for each delivery of asphalt rubber binder ingredients and asphalt rubber binder.

Submit a SDS for each asphalt rubber binder ingredient and the asphalt rubber binder.

At least 15 days before use, submit:

1. Samples of each asphalt rubber binder ingredient:
   1.1. 2 lbs of scrap tire crumb rubber
   1.2. 2 lbs of high natural scrap tire crumb rubber
   1.3. Two 1-quart cans of base asphalt binder
   1.4. Two 1-quart cans of asphalt modifier
2. Asphalt rubber binder formulation and data as follows:
   2.1. For asphalt modifier, include:
      2.1.1. Source of asphalt modifier
      2.1.2. Type of asphalt modifier
      2.1.3. Percentage of asphalt modifier by weight of asphalt binder
      2.1.4. Percentage of combined asphalt binder and asphalt modifier by weight of asphalt rubber binder
      2.1.5. Test results for the specified quality characteristics
   2.2. For crumb rubber modifier, include:
      2.2.1. Each source and type of scrap tire crumb rubber and high natural scrap tire crumb rubber
      2.2.2. Percentage of scrap tire crumb rubber and high natural scrap tire crumb rubber by total weight of asphalt rubber binder
      2.2.3. Test results for the specified quality characteristics
   2.3. For asphalt rubber binder, include minimum reaction time and temperature

Immediately after sampling, submit five 1-quart cans of asphalt rubber binder taken in the presence of the Engineer. Sample must be submitted in insulated shipping containers.

Submit notification 15 minutes before each viscosity test or submit a schedule of testing times.

Submit the log of asphalt rubber binder descending viscosity test results within 1 business day after sampling.

Submit asphalt rubber binder quality control viscosity test results within 1 business day after sampling.

37-2.04A(4) Quality Assurance

37-2.04A(4)(a) General

The equipment used in producing asphalt rubber binder and the equipment used in spreading asphalt rubber binder must be permitted for use or exempted by the local air district.

37-2.04A(4)(b) Quality Control

37-2.04A(4)(b)(i) General

Reserved

37-2.04A(4)(b)(ii) Asphalt Modifiers

For asphalt modifiers, the authorized laboratory must perform quality control sampling and testing at the specified frequency for the following quality characteristics:

Asphalt Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Frequency
Viscosity Flash point	ASTM D445 ASTM D92	1 per shipment
Molecular Analysis:		
Asphaltenes Aromatics	ASTM D2007 ASTM D2007	1 per shipment

37-2.04A(4)(b)(iii) Crumb Rubber Modifiers

Sample and test scrap tire crumb rubber and high natural scrap tire crumb rubber separately.

Perform quality control sampling and testing at the specified frequency for the following quality characteristics:

Crumb Rubber Modifier

Quality characteristic	Test method	Frequency
Scrap tire crumb rubber gradation	California Test 385	1 per 10,000
High natural scrap tire crumb rubber gradation	California Test 385	1 per 3,400 lb
Wire in CRM	California Test 385	1 per 10,000 lb
Fabric in CRM	California Test 385	
CRM particle length	--	
CRM specific gravity	California Test 208	
Natural rubber content in high natural scrap tire crumb rubber	ASTM D297	1 per 3,400 lb

37-2.04A(4)(b)(iv) Asphalt Rubber Binders

For asphalt rubber binders, the authorized laboratory must perform quality control sampling and testing at the specified frequency and location for the following quality characteristics:

Asphalt Rubber Binder Quality Control Requirements

Quality characteristic	Test method	Sampling location	Frequency
Descending viscosity[a] at 375 °F (Pa•s x 10^{-3})	ASTM D7741	Reaction vessel	1 per lot[b]
Viscosity at 375 °F (Pa•s x 10^{-3})	ASTM D7741	Distribution truck	15 minutes before use per lot[b]
Cone penetration at 25 °C (0.10 mm)	ASTM D217	Distribution truck	1 per lot[b]
Resilience at 25 °C (% rebound)	ASTM D5329		
Softening point (°C)	ASTM D36		

[a]Start taking viscosity readings at least 45 minutes after adding crumb rubber modifier and continue taking viscosity readings every 30 minutes until 2 consecutive descending viscosity readings have been obtained and the final viscosity complies with the specification requirement.
[b]A lot is defined in the *MPQP*.

Retain samples from each lot. Test samples for cone penetration, resilience, and softening point for the first 3 lots and if all 3 lots pass, the testing frequency may be reduced to once for every 3 lots.

If QC test results indicate that the asphalt rubber binder does not comply with the specifications, take corrective action and notify the Engineer.

37-2.04A(4)(c) Department Acceptance

37-2.04A(4)(c)(i) General

Reserved

37-2.04A(4)(c)(ii) Asphalt Modifiers

The Department accepts asphalt modifier based on compliance with the requirements shown in the following table:

Asphalt Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Requirement
Viscosity at 100 °C (m^2/s x 10^{-6})	ASTM D445	X ± 3[a]
Flash point (min, °C)	ASTM D92	207
Molecular Analysis:		
Asphaltenes (max, % by mass)	ASTM D2007	0.1
Aromatics (min, % by mass)	ASTM D2007	55

[a]The symbol "X" is the asphalt modifier viscosity.

37-2.04A(4)(c)(iii) Crumb Rubber Modifiers

Scrap tire CRM and high natural CRM are sampled and tested separately.

The Department accepts scrap tire CRM and high natural CRM based on compliance with the requirements shown in the following table:

Crumb Rubber Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Requirement
Wire in CRM (max, %)	California Test 385	0.01
Fabric in CRM (max, %)	California Test 385	0.05
CRM particle length (max, in)	--	3/16
CRM specific gravity	California Test 208	1.1–1.2
Natural rubber content in high natural CRM (%)	ASTM D297	40.0–48.0

The Department accepts CRM gradation based on the requirements shown in the following table:

Crumb Rubber Modifier Gradation Requirements

Quality characteristic	Test method	Requirement			
Gradation (% passing by weight) Sieve size:	California Test 385	Scrap tire crumb rubber		High natural scrap tire crumb rubber	
		Operating range	Contract compliance	Operating range	Contract compliance
No. 8		100	100	--	--
No. 10		95–100	90–100	100	100
No. 16		35–85	32–88	92–100	85–100
No. 30		2–25	1–30	25–95	20–98
No. 50		0–10	0–15	6–35	2–40
No. 100		0–5	0–10	0–7	0–10
No. 200		0–2	0–5	0–3	0–5

If a test result for CRM gradation does not comply with the specifications, the Department deducts the corresponding amount for each gradation test as shown in the following table:

Material	Gradation test result[a]	Deduction
Scrap tire crumb rubber	Operating range < TR < Contract compliance	$250
Scrap tire crumb rubber	TR > Contract compliance	$1,100
High natural scrap tire crumb rubber	Operating range < TR < Contract compliance	$250
High natural scrap tire crumb rubber	TR > Contract compliance	$600

[a]Test Result = TR

Each gradation test for scrap tire crumb rubber represents 10,000 lb or the quantity used in that day's production, whichever is less.

Each gradation test for high natural scrap tire crumb rubber represents 3,400 lb or the quantity used in that day's production, whichever is less.

37-2.04A(4)(c)(iv) Asphalt Rubber Binders

For Department acceptance testing, take a sample of asphalt rubber binder in the Engineer's presence every 5 lots or once a day, whichever is greater. Each sample must be in five 1-quart cans with an open top and friction lid.

For an asphalt rubber binder, acceptance is based on the Department’s sampling and testing for compliance with the requirements shown in the following table:

Asphalt Rubber Binder

Quality characteristic	Test method	Requirement
Cone penetration at 25 °C (0.10 mm)	ASTM D217	25–60
Resilience at 25 °C (% rebound)	ASTM D5329	18–50
Softening point (°C)	ASTM D36	55–88
Viscosity at 375 °F (Pa•s x 10^{-3})[a]	ASTM D7741	1,500–2,500

[a]Prepare sample for viscosity test under California Test 388.

37-2.04A(4)(c)(v) Precoated Aggregate

The Department accepts precoated aggregate based on compliance with the requirements shown in the following table:

Precoated Aggregate Gradation Acceptance Criteria

Quality Characteristic	Test method	Requirement
1/2" gradation (% passing by weight)	California Test 202	
Sieve size:		
3/4"		100
1/2"		85–90
3/8"		0–30
No. 4		0–5
No. 8		--
No. 200		0–1
3/8" gradation (% passing by weight)	California Test 202	
Sieve size:		
3/4"		100
1/2"		95–100
3/8"		70–85
No. 4		0–15
No. 8		0–5
No. 200		0–1

37-2.04B Materials

37-2.04B(1) General

Reserved

37-2.04B(2) Asphalt Binders

Asphalt binder used as the base binder for asphalt rubber binder must comply with the specifications for asphalt binder. Do not modify asphalt binder with polymer.

37-2.04B(3) Asphalt Modifiers

An asphalt modifier must be a resinous, high flash point, and aromatic hydrocarbon. An asphalt modifier must comply with the requirements shown in the following table:

Asphalt Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Requirement
Viscosity at 100 °C (m^2/s x 10^{-6})	ASTM D445	X ± 3[a]
Flash point (min, CL.O.C., °C)	ASTM D92	207
Molecular analysis:		
Asphaltenes by mass (max, %)	ASTM D2007	0.1
Aromatics by mass (min, %)	ASTM D2007	55

[a]*X* denotes the proposed asphalt modifier viscosity from 19 to 36. A change in *X* requires a new asphalt rubber binder submittal.

37-2.04B(4) Crumb Rubber Modifiers

The CRM to be used must be on the Authorized Materials List for crumb rubber modifier.

The CRM must be ground or granulated at ambient temperature.

Scrap tire crumb rubber and high natural scrap tire crumb rubber must be delivered to the asphalt rubber binder production site in separate bags.

Steel and fiber must be separated. If steel and fiber are cryogenically separated, it must occur before grinding and granulating. Cryogenically-produced CRM particles must be large enough to be ground or granulated.

The CRM must be dry, free-flowing particles that do not stick together. A maximum of 3 percent calcium carbonate or talc by weight of CRM may be added. The CRM must not cause foaming when combined with the asphalt binder and asphalt modifier.

The CRM must comply with the requirements shown in the following table:

Crumb Rubber Modifier for Asphalt Rubber Binder

Quality characteristic	Test method	Requirement
Wire in CRM (max, %)	California Test 385	0.01
Fabric in CRM (max, %)	California Test 385	0.05
CRM particle length (max, in)	--	3/16
CRM specific gravity	California Test 208	1.1–1.2

The CRM must comply with the requirements shown in the following table:

Crumb Rubber Modifier Requirements

Quality characteristic	Test method	Requirement	
		Scrap tire crumb rubber	High natural scrap tire crumb rubber
Acetone extract (%)	ASTM D297	6.0–16.0	4.0–16.0
Rubber hydrocarbon (min, %)		42.0–65.0	50.0
Natural rubber content (%)		22.0–39.0	40.0–48.0
Carbon black content (%)		28.0–38.0	--
Ash content (max, %)		8.0	--

Scrap tire crumb rubber gradation must comply with the gradation requirements shown in the following table:

Scrap Tire Crumb Rubber Gradation

Quality characteristic	Test method	Requirement		
Gradation (% passing by weight) Sieve size:	California Test 385	Gradation limit	Operating range	Contract compliance
No. 8		100	100	100
No. 10		98–100	95–100	90–100
No. 16		45–75	35–85	32–88
No. 30		2–20	2–25	1–30
No. 50		0–6	0–10	0–15
No. 100		0–2	0–5	0–10
No. 200		0	0–2	0–5

High natural scrap tire crumb rubber gradation must comply with the gradation requirements shown in the following table:

High Natural Scrap Tire Crumb Rubber Gradation

Quality characteristic	Test method	Requirement		
Gradation (% passing by weight) Sieve size:	California Test 385	Gradation limit	Operating range	Contract compliance
No. 10		100	100	100
No. 16		95–100	92–100	85–100
No. 30		35–85	25–95	20–98
No. 50		10–30	6–35	2–40
No. 100		0–4	0–7	0–10
No. 200		0–1	0–3	0–5

37-2.04B(5) Asphalt Rubber Binders

An asphalt rubber binder must be a combination of:

1. Asphalt binder
2. Asphalt modifier
3. Crumb rubber modifier

Asphalt rubber binder blending equipment must be authorized under the Department's *MPQP*.

The blending equipment must allow the determination of weight percentages of each asphalt rubber binder ingredient.

An asphalt rubber binder must be 79 ± 1 percent by weight asphalt binder and 21 ± 1 percent by weight of CRM. The minimum percentage of CRM must be 20.0 percent and lower values must not be rounded up.

The CRM must be 75 ± 2 percent by weight scrap tire crumb rubber and 25 ± 2 percent by weight high natural scrap tire crumb rubber.

An asphalt modifier and asphalt binder must be blended at the production site. An asphalt modifier must be from 2.5 to 6.0 percent by weight of the asphalt binder in the asphalt rubber binder. The asphalt rubber binder supplier determines the exact percentage.

If blended before adding CRM, the asphalt binder must be from 375 to 440 degrees F when an asphalt modifier is added and the mixture must circulate for at least 20 minutes. An asphalt binder, asphalt modifier, and CRM may be proportioned and combined simultaneously.

The blend of an asphalt binder and an asphalt modifier must be combined with the CRM at the asphalt rubber binder production site. The asphalt binder and asphalt modifier blend must be from 375 to 440 degrees F when the CRM is added. Combined ingredients must be allowed to react at least 45 minutes at temperatures from 375 to 425 degrees F except the temperature must be at least 10 degrees F below the flash point of the asphalt rubber binder.

After reacting, the asphalt rubber binder must comply with the requirements shown in the following table:

Asphalt Rubber Binder

Quality characteristic	Test method	Requirement
Cone penetration at 25 °C (0.10 mm)	ASTM D217	25–60
Resilience at 25 °C (% rebound)	ASTM D5329	18–50
Softening point (°C)	ASTM D36	55–88
Viscosity at 375 °F ($Pa \cdot s \times 10^{-3}$)[a]	ASTM D7741	1,500–2,500

[a]Prepare sample for viscosity test under California Test 388.

Maintain asphalt rubber binder at a temperature from 375 to 415 degrees F.

Stop heating unused asphalt rubber binder 4 hours after the 45-minute reaction period. Reheating asphalt rubber binder that cools below 375 degrees F is a reheat cycle. Do not exceed 2 reheat cycles. If reheating, the asphalt rubber binder must be from 375 to 415 degrees F before use.

During reheating, you may add CRM. The CRM must not exceed 10 percent by weight of the asphalt rubber binder. Allow added CRM to react for at least 45 minutes. Reheated asphalt rubber binder must comply with the specifications for asphalt rubber binder.

37-2.04B(6) Precoated Aggregate

Before precoating with asphalt binder, aggregate for an asphalt rubber binder chip seal must comply with the gradation requirements shown in the following table:

Asphalt Rubber Binder Chip Seal Aggregate Gradation

Quality characteristic	Test method	Requirement	
Gradation (% passing by weight) Sieve size:	California Test 202	1/2"	3/8"
3/4"		100	100
1/2"		85–90	95–100
3/8"		0–30	70–85
No. 4		0–5	0–15
No. 8		--	0–5
No. 200		0–1	0–1

37-2.04C Construction

37-2.04C(1) General

Reserved

37-2.04C(2) Equipment

Distributor trucks must be equipped with:

1. Mixing and heating unit
2. Observation platform on the rear of the truck for an observer on the platform to see the nozzles and unplug them if needed

37-2.04C(3) Asphalt Rubber Binder Application

Apply the asphalt rubber binder when the ambient temperature is from 60 to 105 degrees F and the pavement surface temperature is at least 55 degrees F.

Do not apply the asphalt rubber binder unless enough aggregate is available at the job site to cover the asphalt rubber binder within 2 minutes. Intersections, turn lanes, gore points, and irregular areas must be covered within 15 minutes.

Do not apply asphalt rubber binder when pavement is damp or during high wind conditions. If authorized, you may adjust the distributor bar height and distribution speed and use shielding equipment during high wind conditions.

When applied, the temperature of the asphalt rubber binder must be from 385 to 415 degrees F.

Apply the asphalt rubber binder at a rate from 0.55 to 0.65 gal/sq yd. You may reduce the application rate by 0.050 gal/sq yd in the wheel paths.

37-2.04C(4) Precoated Aggregate Spreading

Spread aggregate at a rate from 28 to 40 lb/sq yd. Do not spread aggregate more than 200 feet ahead of the completed initial rolling.

37-2.04C(5) Rolling and Sweeping

Perform initial rolling within 90 seconds of spreading aggregate. If authorized for final rolling, you may use a steel-wheeled roller weighing from 8 to 10 tons in static mode only.

Perform a final sweeping before Contract acceptance. The final sweeping must not dislodge aggregate.

37-2.04D Payment

Asphalt rubber binder is measured as specified for asphalt binder.

37-2.05 STRESS ABSORBING MEMBRANE INTERLAYERS

37-2.05A General

Section 37-2.05 includes specifications for placing stress absorbing membrane interlayers (SAMI).

Comply with section 37-2.04 except a flush coat is not required.

Traffic must not be allowed on a SAMI.

37-2.05B Materials

For a SAMI, aggregate must comply with the 3/8-inch gradation.

37-2.05C Construction

If a SAMI is overlaid in the same work shift, section 37-2.01C(4)(e) does not apply.

Final sweeping is not required for a SAMI.

37-2.05D Payment

Not Used

37-2.06 MODIFIED ASPHALT BINDER CHIP SEALS

Reserved

37-2.07 SCRUB SEALS

Reserved

37-3 SLURRY SEALS AND MICRO-SURFACINGS

37-3.01 GENERAL

37-3.01A General

37-3.01A(1) Summary

Section 37-3.01 includes general specifications for applying slurry seals and micro-surfacings.

37-3.01A(2) Definitions

Reserved

37-3.01A(3) Submittals

At least 15 days before starting placement of a slurry seal or micro-surfacing, submit:

1. Samples for:
   - 1.1. Asphaltic emulsion slurry seal, two 1-quart wide mouth plastic containers with screw top lid of asphaltic emulsion
   - 1.2 Polymer modified asphaltic emulsion slurry seal, two 1-quart wide mouth plastic containers with screw top lid of polymer modified asphaltic emulsion
   - 1.3. Micro-surfacing, two 1-quart wide mouth plastic containers with screw top lid of micro-surfacing emulsion
2. Asphaltic emulsion, polymer modified asphaltic emulsion, or micro-surfacing emulsion data as follows:
   - 2.1. Supplier and Type/Grade of asphaltic emulsion
   - 2.2. Type of modifier polymer for polymer modified asphaltic emulsion or micro-surfacing emulsion
   - 2.3. Copy of the specified test results for asphaltic emulsion, polymer modified asphaltic emulsion, or micro-surfacing emulsion
3. 50 lb of aggregate
4. Aggregate test results for the followings:
   - 4.1. Gradation
   - 4.2. Los Angeles Rattler
   - 4.3. Percent of crushed particles

4.4 Sand equivalent
4.5 Durability

At least 10 days before starting placement of a slurry seal or micro-surfacing, submit a laboratory report of test results and the proposed mix design from an authorized laboratory. The authorized laboratory must sign the laboratory report and mix design.

The report must include:

1. Test results used in the mix design compared with specification requirements
2. Proportions based on the dry weight of aggregate, including ranges, for:
   2.1. Aggregate
   2.2. Water
   2.3. Additives
   2.4. Mineral filler
   2.5. Slurry seal emulsion or micro-surfacing emulsion residual asphalt content
3. Recommended changes to the proportions based on heating the mixture to 100 degrees F and mixing for 60 seconds, if atmospheric temperatures during application will be 90 degrees F or above, for:
   3.1. Water
   3.2. Additives
   3.3. Mineral filler
4. Quantitative moisture effects on the aggregate's unit weight determined under ASTM C29M

If the mix design consists of the same materials covered by a previous laboratory report, you may submit the previous laboratory report that must include material testing data performed within the previous 12 months for authorization.

If you change any of the materials in the mix design, submit a new mix design and laboratory report at least 10 days before starting slurry seal or micro-surfacing work.

Submit a certificate of compliance as specified for asphaltic emulsion in section 94-1.01C with each shipment of asphaltic emulsion, polymer modified asphaltic emulsion or micro-surfacing emulsion.

Submit quality control test results for the quality characteristics within the reporting times allowance after sampling shown in the following table:

Quality Control Test Reporting Requirements

Quality characteristic	Maximum reporting time allowance
Los Angeles Rattler loss (max, %)	2 business days
Percent of crushed particles (min, %)	2 business days
Durability (min)	2 business days
Resistance of fine aggregate to degradation by abrasion in the Micro-Deval Apparatus (% loss by weight)	2 business days
Gradation (% passing by weight)	48 hours
Sand equivalent (min)	48 hours
Moisture content (%)	48 hours

Within 3 days after taking asphaltic emulsion, polymer modified asphaltic emulsion or micro-surfacing emulsion quality control samples, submit the authorized laboratory's test results.

37-3.01A(4) Quality Assurance

37-3.01A(4)(a) General

Your authorized laboratory must be able to perform International Slurry Surfacing Association tests and mix design.

37-3.01A(4)(b) Quality Control

37-3.01A(4)(b)(i) General

Reserved

37-3.01A(4)(b)(ii) Aggregate

For aggregate, the authorized laboratory must perform sampling and testing at the specified frequency and location for the following quality characteristics:

Aggregate Quality Control

Quality characteristic	Test method	Minimum sampling and testing frequency	Location of sampling
Los Angeles Rattler loss (max, %) At 500 revolutions	California Test 211	1st day of production	See California Test 125
Percent of crushed particles (min, %)	AASHTO T 335	1st day of production	See California Test 125
Sand equivalent (min)	California Test 217	1 per working stockpile per day	See California Test 125
Resistance of fine aggregate to degradation by abrasion in the Micro-Deval Apparatus (% loss by weight)	ASTM D7428	1 per working stockpile per day	See California Test 125
Gradation (% passing by weight)	California Test 202	1 per working stockpile per day	See California Test 125
Moisture content, from field stockpile (%)	AASHTO T 255[a]	1 per working stockpile per day	See California Test 125

[a]Test aggregate moisture at field stockpile every 2 hours if you are unable to maintain the moisture content to within a maximum daily variation of ±0.5 percent.

37-3.01A(4)(b)(iii) Slurry Seals and Micro-surfacings

Reserved

37-3.01A(4)(c) Department Acceptance

Slurry Seal and micro-surfacing acceptance is based on:

1. Visual inspection for the following:
   - 1.1. Uniform surface texture throughout the work limits.
   - 1.2. Marks in the surface:
     - 1.2.1. Up to 4 marks in the completed slurry seal or micro-surfacing surface that are up to 1 inch wide and up to 6 inches long per 1000 square feet of slurry seal or micro-surfacing placed.
     - 1.2.2. No marks in the completed slurry seal or micro-surfacing surface that are over 1 inch wide or 6 inches long.
   - 1.3. Excessive raveling consisting of the separation of the aggregate from the asphaltic emulsion, polymer modified asphaltic emulsion or micro-surfacing emulsion.
   - 1.4. Bleeding consists of the occurrence of a film of asphaltic material on the surface of the slurry seal or micro-surfacing.
   - 1.5. Delaminating of slurry seal or micro-surfacing from the existing pavement.
   - 1.6. Rutting or wash-boarding.
2. Department's sampling and testing for compliance with the requirements for aggregate shown in the following table:

Aggregate Gradation Acceptance Criteria

Quality characteristic	Test method	Requirements		
Gradation (% passing by weight) Sieve Size:	California Test 202	Type I	Type II	Type III
3/8"		--	100	100
No. 4		100	94–100	70–90
No. 8		90–100	65–90	45–70
No. 16		60–90	40–70	28–50
No. 30		40–65	25–50	19–34
No. 200		10–20	5–15	5–15

An aggregate gradation test represents 300 tons or 1 day's production, whichever is less.

If test results for aggregate gradation do not comply with the specifications, you may remove the slurry seal or micro-surfacing represented by the test results or request it remain in place with a payment deduction. If your request is authorized, the Department deducts:

1. $1.75 per ton of slurry seal for each noncompliant aggregate gradation
2. $2.00 per ton of micro-surfacing for each noncompliant aggregate gradation

37-3.01B Materials

37-3.01B(1) General

Additional water must not cause separation of the asphaltic emulsion, polymer modified asphaltic emulsion or micro-surfacing emulsion from the aggregate before placement.

You may use an additive that does not adversely affect the slurry seal or micro-surfacing.

37-3.01B(2) Aggregate

Aggregate must be rock dust. Aggregate must be free from vegetable matter, deleterious substances, caked or clay lumps, and oversized particles.

Aggregate for a slurry seal and micro-surfacing must comply with the gradations shown in the following table:

Aggregate Gradation

Quality characteristic	Test method	Requirements		
Gradation (% passing by weight) Sieve size:	California Test 202	Type I	Type II	Type III
3/8”		--	100	100
No. 4		100	94-100	70-90
No. 8		90-100	65-90	45-70
No. 16		60-90	40-70	28-50
No. 30		40-65	25-50	19-34
No. 200		10-20	5-15	5-15

37-3.01C Construction

37-3.01C(1) General

Before applying slurry seals or micro-surfacings, cover manholes, valve and monument covers, grates, and other exposed facilities located within the area of application using plastic or oil resistant construction paper secured by tape or adhesive to the facility being covered. Reference the covered facilities with enough control points to relocate the facilities after application of the slurry seals or micro-surfacings.

37-3.01C(2) Proportioning

Proportion slurry seal and micro-surfacing ingredients in compliance with the authorized mix design.

37-3.01C(3) Mixing and Spreading Equipment

37-3.01C(3)(a) General

Mixing and spreading equipment for slurry seals and micro-surfacings must proportion the asphaltic emulsions, water, aggregate, and any additives by volume and mix them in continuous pug mill mixers.

Introduce emulsions into the mixer with a positive displacement pump. If you use a variable-rate pump, the adjusting unit must be sealed in its calibrated position.

Introduce water into the mixer through a meter that measures gallons.

Choose a truck mounted mixer-spreader or continuous self-loading mixer spreader.

37-3.01C(3)(b) Truck Mounted Mixer Spreaders

Truck mounted mixer spreaders must comply with:

1. Rotating and reciprocating equipment must be covered with metal guards.
2. Proportion aggregate using a belt feeder with an adjustable cutoff gate. The Engineer verifies the height of the gate opening.
3. Belt feeder must have a depth monitor device. The depth monitor device must automatically shut down power to the belt feeder when the aggregate depth is less than 70 percent of the target depth.
4. Separate monitor device must detect the revolutions of the belt feeder. This device must automatically shut down power to the belt feeder if it detects no revolutions. If the belt feeder is an integral part of the equipment's drive chain, the monitor device is not required.
5. Aggregate belt feeder must be connected directly to the drive on the emulsion pump. The aggregate feeder drive shaft must have a revolution counter reading the nearest 0.10 revolution for micro-surfacing, and nearest 1 revolution for slurry seal.
6. Emulsion storage must be equipped with a device that automatically shuts down power to the emulsion pump and aggregate belt feeder when the level of stored emulsion is lowered. To allow for normal fluctuations, there may be a delay of 3 seconds between detection of low emulsion storage levels or low aggregate depths and automatic power shut down.
7. Emulsion storage must be located immediately before the emulsion pump.
8. Emulsion storage tank must have a temperature indicator at the pump suction level. The indicator must be accurate to ±5 degrees F.
9. No-flow and revolution warning devices must be in working condition. Low-flow indicators must be visible while walking alongside the equipment.

37-3.01C(3)(c) Continuous Self-Loading Mixer Spreaders

Continuous self-loading mixer spreaders must be automatically sequenced and self-propelled. The mixing machine must deliver each material to a double shafted mixer and discharge the mixed material on a continuous flow basis. The mixing machines must have sufficient storage capacity to maintain a continuous supply of material to the proportioning controls. The mixing machine operators must have full control of forward and reverse speeds during placement.

37-3.01C(3)(d) Spreader Boxes

The spreader boxes used to spread slurry seals and micro-surfacings must be:

1. Capable of spreading the slurry seal or micro-surfacing a minimum of 12 feet wide and preventing the loss of slurry seal or micro-surfacing.
2. Equipped with flexible rubber belting on each side. The belting must contact the pavement to prevent the loss of slurry seal or micro-surfacing from the box.
3. Equipped to uniformly apply the slurry seal or micro-surfacing on superelevated sections and shoulder slopes. Micro-surfacing spreader box must be equipped with reversible motor driven augers.
4. Equipped with a series of strike-off devices at its rear.
    - 4.1. The leading strike off device must be:
        - 4.1.1. Fabricated of a suitable material such as steel or stiff rubber
        - 4.1.2. Designed to maintain close contact with the pavement during spreading
        - 4.1.3. Capable of obtaining the specified thickness
        - 4.1.4. Capable of being adjusted to the various pavement cross sections
    - 4.2. The final strike-off device must be:
        - 4.2.1. Fabricated of flexible material that produces a uniform texture in the finished surface

4.2.2. Cleaned daily and changed if longitudinal scouring occurs in the slurry seal of micro-surfacing

5. Clean and free of slurry seal or micro-surfacing at the start of each work shift.

37-3.01C(3)(e) Shoulder Equipment

Spread the slurry seal or micro-surfacing on shoulders with a device such as an edge box that forms clean and straight joints and edges.

37-3.01C(3)(f) Equipment Calibration

Equipment calibration must comply with the *MPQP*. Notify the Engineer at least 5 business days before calibrating.

If the Department authorizes a truck or continuous mixer spreader, its calibration is valid for 6 months provided you:

1. Use the same truck or continuous mixer spreader verified with a unique identifying number
2. Use the same materials in compliance with the authorized mix design
3. Do not perform any repair or alteration to the proportioning systems

Calibrate the adjustable cut-off gate settings of each truck or continuous mixer spreader on the project to achieve the correct delivery rate of aggregate and emulsion per revolution of the aggregate feeder under the *MPQP*.

Checks must be performed for each aggregate source using an authorized vehicle scale.

Individual checks of the aggregate belt feeder's delivery rate to the pug mill mixer must not vary more than 2 percent from the average of 3 runs of at least 3 tons each.

Before using a variable-rate emulsion pump, the pump must be calibrated and sealed in the calibrated condition under the *MPQP*.

Individual checks of the emulsion pump's delivery rate to the pug mill mixer must not vary more than 2 percent from the average of 3 runs of at least 500 gal each.

37-3.01C(4) Surface Preparation

Immediately before applying slurry seals or micro-surfacings, clean the surface to receive slurry seals or micro-surfacings by removing any extraneous material affecting adhesion of the slurry seal or micro-surfacing with the existing surface. Use self-propelled power brooms or other methods such as flushing to clean the existing pavement.

37-3.01C(5) Placement

37-3.01C(5)(a) General

If truck-mounted mixer-spreaders are used, keep at least 2 operational spreaders at the job site during placement.

Spread slurry seals and micro-surfacings uniformly and do not spot, rehandle, or shift the mixture. However in areas inaccessible to spreading equipment, spread the slurry seal or micro-surfacing mixtures with hand tools or other authorized methods. If placing with hand tools, lightly dampen the area first.

You may fog the roadway surface with water ahead of the spreader box. The fog spray must be adjusted for pavement:

1. Temperature
2. Surface texture
3. Dryness

You determine the application rates for slurry seals or micro-surfacings and the Engineer authorizes the application rates. Spread within 10 percent of authorized rate.

The mixtures must be uniform and homogeneous after spreading, and there must not be separation of the emulsion and aggregate after setting.

37-3.01C(5)(b) Weather Conditions

Only place slurry seals or micro-surfacings if both the pavement and air temperatures are at least 50 degrees F and rising. The expected high temperature must be at least 65 degrees F within 24 hours after placement.

Do not place slurry seals or micro-surfacings if rain is imminent or the air temperature is expected to be below 36 degrees F within 24 hours after placement.

37-3.01C(5)(c) Joints

Transverse and longitudinal joints must be:

1. Uniform
2. Straight
3. Neat in appearance
4. Without material buildup
5. Without uncovered areas

Transverse joints must be butt-type joints.

Prevent double placement at transverse joints over previously placed slurry seals or micro-surfacings.

Place longitudinal joints:

1. On centerlines, lane lines, edge lines, or shoulder lines
2. With overlaps not more than 4 inches

You may request other longitudinal joint patterns if they do not adversely affect the slurry seals or micro-surfacings.

The maximum difference between the pavement surface and the bottom edge of a 12-foot straightedge placed perpendicular to the longitudinal joint must be 0.04 foot.

37-3.01C(5)(d) Finished Surfaces

Finished slurry seals or micro-surfacings must be smooth and free of irregularities such as scratch or tear marks. You may leave up to 4 marks that are up to 1 inch wide and 6 inches long per 75 linear feet of slurry seal or micro-surfacing placed. Do not leave any marks that are over 1 inch wide or 6 inches long.

37-3.01C(5)(e) Maintenance Sweeping

Sweep the slurry seals or micro-surfacings 24 hours after placement without damaging the slurry seals or micro-surfacings. For 4 days afterwards, sweep the slurry seals or micro-surfacings daily unless determined otherwise by the Engineer.

37-3.01C(5)(f) Repair of Early Distress

The slurry seals or micro-surfacings must not show bleeding, raveling, separation, or other distresses for 15 days after placing. If bleeding, raveling, delaminating, rutting, or wash-boarding occurs after placing the slurry seals or micro-surfacings, make repairs using an authorized method.

37-3.01D Payment

Not Used

37-3.02 SLURRY SEALS

37-3.02A General

37-3.02A(1) Summary

Section 37-3.02 includes specifications for applying slurry seals.

Applying a slurry seal consists of spreading a mixture of asphaltic emulsion or polymer modified asphaltic emulsion, aggregate, additives, and water on a surface or pavement.

37-3.02A(2) Definitions

Reserved

37-3.02A(3) Submittals

Immediately after sampling, submit two 1-quart wide mouth plastic containers of asphaltic emulsion or polymer modified asphaltic emulsion taken in the presence of the Engineer. Samples must be submitted in insulated shipping containers.

37-3.02A(4) Quality Assurance

37-3.02A(4)(a) General

Reserved

37-3.02A(4)(b) Quality Control

37-3.02A(4)(b)(i) General

Take samples of asphaltic emulsion and polymer modified asphaltic emulsion from the tank truck at mid load or from a sampling tap or thief. Before taking samples, draw and dispose of 1 gallon. In the presence of the Engineer take two 1-quart samples in wide mouth plastic containers with lined, sealed lids for acceptance testing.

37-3.02A(4)(b)(ii) Asphaltic Emulsion

For asphaltic emulsions, the authorized laboratory must perform quality control sampling and testing at the specified frequency and location for the following quality characteristics:

Asphaltic Emulsion

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling location
Saybolt Furol Viscosity, at 25 °C (Saybolt Furol seconds)	AASHTO T 59	Minimum 1 per day per delivery truck	Delivery truck
Sieve Test (%)			
Storage stability, 1 day (%)			
Residue by distillation (%)			
Particle charge[a]			
Tests on Residue from Distillation Test:			
Penetration, 25 °C	AASHTO T 49	Minimum 1 per day per delivery truck	Delivery truck
Ductility	AASHTO T 51		
Solubility in tricloroethylene	AASHTO T 44		

[a]If the result of the particle charge is inconclusive, the asphaltic emulsion must be tested for pH under ASTM E70. Grade QS1h asphaltic emulsion must have a minimum pH of 7.3. Grade CQS1h asphaltic emulsion must have a maximum pH of 6.7.

37-3.02A(4)(b)(iii) Polymer Modified Asphaltic Emulsion

For polymer modified asphaltic emulsions, the authorized laboratory must perform quality control sampling and testing at the specified frequency and location for the following quality characteristics:

Polymer Modified Asphaltic Emulsion

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling Location
Tests on emulsion:			
Saybolt Furol Viscosity at 25 °C (Saybolt Furol seconds)	AASHTO T 59	Minimum 1 per day per delivery truck	Delivery truck
Sieve test (%)	AASHTO T 59		
Storage stability after 1 day (%)	AASHTO T 59		
Residue by evaporation (min, %)	California Test 331		
Particle charge	AASHTO T 59		
Tests on residue by evaporation:			
Penetration at 25 °C	AASHTO T 49	Minimum 1 per day per delivery truck	Delivery truck
Ductility at 25 °C (min, mm)	AASHTO T 51		
Torsional recovery (min, %) Or Polymer content based on residual asphalt (min, %)	California Test 332 California Test 401		

37-3.02A(4)(c) Department Acceptance

For a slurry seal asphaltic emulsion and polymer modified asphaltic emulsion, acceptance is based on the Department's sampling and testing for compliance with the requirements for the quality characteristics specified.

Aggregate acceptance is based on the Department's sampling and testing for compliance with the requirements shown in the following table:

Aggregate Acceptance Criteria

Quality characteristic	Test method	Requirement
Los Angeles Rattler loss (max, %) At 500 revolutions	California Test 211[a]	35
Percent of crushed particles (min, %)	California Test 205	95
Durability (min)	California Test 229	55
Sand equivalent (min) Type I Type II Type III	California Test 217	 45 55 60

[a]California Test 211 must be performed on the source aggregate before crushing.

A sand equivalent test represents 300 tons or 1 day's production, whichever is less.

If test results for sand equivalent do not comply with the specifications, you may remove the slurry seal represented by the test results or request it remain in place with a payment deduction. If your request is authorized, the Department deducts $1.75 per ton of slurry seal for each noncompliant sand equivalent test.

37-3.02B Materials

37-3.02B(1) General

Reserved

37-3.02B(2) Asphaltic Emulsions

An asphaltic emulsion must comply with the requirements in Section 94. The asphaltic emulsion must be Grade CQS1h.

37-3.02B(3) Polymer Modified Asphaltic Emulsions

A polymer modified asphaltic emulsion must:

1. Consist of an elastomeric polymer mixed with an asphaltic material uniformly emulsified with water and an emulsifying or stabilization agent.
2. Use either neoprene polymer or butadiene and styrene copolymer. The polymer must be homogeneous and milled into the asphaltic emulsion at the colloid mill.
3. Be Grade PMCQS1h and must comply with the requirements shown in the following table:

Polymer Modified Asphaltic Emulsion Requirements

Quality characteristic	Test method	Requirement
Tests on emulsion:		
Saybolt Furol Viscosity at 25 °C (Saybolt Furol seconds)	AASHTO T 59	15–90
Sieve test (%)	AASHTO T 59	0–0.3
Storage stability after 1 day (%)	AASHTO T 59	0–1
Residue by evaporation (min, %)	California Test 331	60
Particle charge	AASHTO T 59	Positive
Tests on residue by evaporation:		
Penetration at 25 °C	AASHTO T 49	40–90
Ductility at 25 °C (min, mm)	AASHTO T 51	400
Torsional recovery (min, %) Or Polymer content based on residual asphalt (min, %)	California Test 332 California Test 401	18 2.5

37-3.02B(4) Aggregate

Aggregate must comply with the quality characteristic requirements shown in the following table:

Aggregate Requirements

Quality characteristic	Test method	Requirement
Los Angeles Rattler loss (max, %) At 500 revolutions	California Test 211[a]	 35
Percent of crushed particles (min, %)	California Test 205	95
Durability (min)	California Test 229	55
Sand equivalent (min) Type I Type II Type III	California Test 217	 45 55 60

[a]California Test 211 must be performed on the source aggregate before crushing. The aggregate supplier must certify that the crushed aggregate being used on the project is manufactured from the source aggregate complying with the LA rattler requirements.

37-3.02B(5) Slurry Seal Mix Design

The slurry seal mix design, using project source aggregate, an asphaltic emulsion, and set-control agents if any, must comply with the requirements shown in the following table:

Slurry Seal Mix Design Requirements

Quality characteristic	Test method[a]	Requirement
Consistency (max, mm)	Technical Bulletin 106	30
Wet stripping	Technical Bulletin 114	Pass
Compatibility	Technical Bulletin 115	Pass[b]
Cohesion test, within 1 hour (min, kg-mm)	Technical Bulletin 139	200
Wet track abrasion (max, g/m^2)	Technical Bulletin 100	810

[a]Test methods are by the International Slurry Surfacing Association.

[b]Mixing test must pass at the maximum expected air temperature at the job site during placement.

The mix design must have the percent of asphaltic residue, based on percentage by weight of the dry aggregate, within the ranges shown in the following table:

Slurry seal type	Residue range
Type I	10–16
Type II	7.5–13.5
Type III	6.5–12.0

Determine the exact percentage based on the design asphalt binder content and the asphalt residual content of the asphaltic emulsion furnished.

37-3.02C Construction

37-3.02C(1) General

Reserved

37-3.02C(2) Proportioning

After proportioning, slurry seal mixtures must be workable.

37-3.02C(3) Mixing and Spreading Equipment

Reserved

37-3.02C(4) Placement

The slurry seal spread rates must be within the ranges shown in the following table:

Slurry Seal Spread Rates

Slurry seal type	Application range (lb of dry aggregate/sq yd)
Type I	8–12
Type II	10–18
Type III	20–25

Within 4 hours after placement, slurry seals must be set enough to allow traffic without pilot cars. Protect slurry seals from damage until it has set and will not adhere or be picked up by vehicle tires. Slurry seals must not exhibit distress from traffic such as bleeding, raveling, separation or other distresses.

37-3.02D Payment

The payment quantity for slurry seal is the weight determined by combining the weights of the aggregate and asphaltic emulsion or polymeric asphaltic emulsion. The payment quantity for slurry seal does not include the weights of the added water and set-control additives.

37-3.03 MICRO-SURFACINGS

37-3.03A General

37-3.03A(1) Summary

Section 37-3.03 includes specifications for applying micro-surfacings.

Applying a micro-surfacing consists of spreading a mixture of a micro-surfacing emulsion, water, additives, mineral filler, and aggregate on the pavement.

37-3.03A(2) Definitions

Reserved

37-3.03A(3) Submittals

Immediately after sampling, submit two 1-quart wide mouth plastic containers of micro-surfacing emulsion taken in the presence of the Engineer. Samples must be submitted in insulated shipping container.

37-3.03A(4) Quality Assurance

37-3.03A(4)(a) General

Reserved

37-3.03A(4)(b) Quality Control

37-3.03A(4)(b)(i) General

Reserved

37-3.03A(4)(b)(ii) Micro-surfacing Emulsions

Take samples from the truck tank at mid load from a sampling tap or thief. Before taking samples, draw and dispose of 1 gallon. In the presence of the Engineer, take two 1-quart wide mouth plastic containers for acceptance testing.

For a micro-surfacing emulsion, the authorized laboratory must perform quality control sampling and testing at the specified frequency and location for the quality characteristics shown in the following table:

Micro-Surfacing Emulsion

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling location
Tests on emulsion:			
Saybolt Furol Viscosity, at 25°C (Saybolt Furol seconds)	AASHTO T 59	Minimum 1 per day per delivery truck	Delivery truck
Storage stability, 1 day (max, %)[a]			
Sieve test (max, %)			
Residue by evaporation (min, %)	California Test 331	Minimum 1 per day per delivery truck	Delivery truck
Tests on residue from evaporation test:			
Penetration at 25 °C	AASHTO T 49	Minimum 1 per day per delivery truck	Delivery truck
Softening point (min, ºC)	AASHTO T 53		

[a]Storage stability test will be run if the storage exceeds 48 hours

37-3.03A(4)(c) Department Acceptance

For micro-surfacing emulsions, acceptance is based on the Department's sampling and testing for compliance with the requirements shown in the following table:

Micro-surfacing Emulsion Acceptance Criteria

Quality characteristic	Test method	Requirement
Tests on emulsion:		
Saybolt Furol Viscosity at 25 °C (Saybolt Furol seconds)	AASHTO T 59	15–90
Sieve test (%)	AASHTO T 59	0.30
Storage stability, 1 day (max, %) Settlement[a], 5 days (max, %)	AASHTO T 59 ASTM D244	0–1 5
Residue by evaporation (min, %)	California Test 331	62
Tests on residue by evaporation:		
Penetration at 25 °C	AASHTO T 49	40–90
Softening point (min, ºC)	AASHTO T 53	57

[a]Settlement test on emulsion is not required if used within 48 hours of shipment.

Acceptance of aggregate, except mineral filler, is based on the Department's sampling and testing for compliance with the requirements shown in the following table:

Aggregate Acceptance Criteria

Quality characteristic	Test method	Requirement
Los Angeles Rattler loss (max, %) At 500 revolutions	California Test 211[a]	 35
Percent of crushed particles (min, %)	California Test 205	95
Durability (min)	California Test 229	65
Sand equivalent (min) Type II Type III	California Test 217	 65 65

[a]California Test 211 must be performed on the aggregate before crushing. The aggregate supplier must certify that the crushed aggregate being used on the project is manufactured from the source aggregate complying with the LA rattler requirements.

An aggregate sand equivalent test represents 300 tons or 1 day's production, whichever is less.

If the test results for aggregate sand equivalent do not comply with the specifications, you may remove the micro-surfacing represented by the test results or request it remain in place with a payment deduction. If your request is authorized, the Department deducts $2.00 per ton of micro-surfacing for each noncompliant aggregate sand equivalent test.

37-3.03B Materials

37-3.03B(1) General

Reserved

37-3.03B(2) Micro-surfacing Emulsions

A micro-surfacing emulsion must be a homogeneous mixture of asphalt, an elastomeric polymer and an emulsifier solution.

Add an elastomeric polymer modifier to asphalt or emulsifier solution before emulsification. An elastomeric polymer solid must be a minimum of 3 percent by weight of the micro-surfacing emulsion's residual asphalt.

A micro-surfacing emulsion must comply with the requirements shown in the following table:

Micro-surfacing Emulsion Requirements

Quality characteristic	Test method	Requirement
Tests on emulsion:		
Saybolt Furol Viscosity at 25 °C (Saybolt Furol seconds)	AASHTO T 59	15–90
Sieve test (%)	AASHTO T 59	0.30
Storage stability, 1 day (max, %)	AASHTO T 59	0–1
Settlement[a], 5 days (max, %)	ASTM D244	5
Residue by evaporation (min, %)	California Test 331	62
Tests on residue by evaporation:		
Penetration at 25 °C	AASHTO T 49	40–90
Softening point (min, ºC)	AASHTO T 53	57

[a]Settlement test on emulsion is not required if used within 48 hours of shipment.

37-3.03B(3) Aggregate

Aggregate must comply with the quality characteristic requirements shown in the following table:

Aggregate Requirements

Quality characteristic	Test method	Requirement
Los Angeles Rattler loss (max, %) At 500 revolutions	California Test 211[a]	 35
Percent of crushed particles (min, %)	California Test 205	95
Durability (min)	California Test 229	65
Sand equivalent (min) Type II Type III	California Test 217	 65 65

[a]California Test 211 must be performed on the source aggregate before crushing. The aggregate supplier must certify that the crushed aggregate being used on the project is manufactured from the source aggregate complying with the LA rattler requirements.

37-3.03B(4) Mineral Fillers

If a mineral filler is used, it must be type I or type II Portland cement. A mineral filler used during mix design must be used during production.

37-3.03B(5) Micro-Surfacing Mix Designs

The micro-surfacing mix design must have the material proportion limits shown in the following table:

Micro-surfacing Mix Design Proportion Limits

Material	Proportion limits
Micro-surfacing emulsion asphalt residual content (% of dry weight of aggregate)	5.5–10.5
Water and additives	As Required
Mineral filler (% of dry weight of aggregate)	0–3

The micro-surfacing mix design must comply with the requirements shown in the following table:

Micro-surfacing Mix Design Requirements

Quality characteristics	Test method[a]	Requirement
Wet cohesion At 30 minutes (set) (min, kg-cm) At 60 minutes (traffic) (min, kg-cm)	Technical Bulletin 139	 12 20
Excess asphalt (max, g/m^2)	Technical Bulletin 109	540
Wet stripping (min, %)	Technical Bulletin 114	90
Wet track abrasion loss 6-day soak (max, g/m^2)	Technical Bulletin 100	 810
Displacement Lateral (max, %) Specific gravity after 1000 cycles of 57 kg (max)	Technical Bulletin 147A	 5 2.10
Classification compatibility (min, grade points)	Technical Bulletin 144	(AAA, BAA) 11
Mix time at 25 °C (min)	Technical Bulletin 113	Controllable to 120 seconds

[a]Test methods are by the International Slurry Surfacing Association.

37-3.03B(6) Tack Coats

If there is a bid item for tack coat, you must coat the pavement surface with an asphaltic emulsion mixed with additional water before applying a micro-surfacing. The maximum ratio of water to asphaltic emulsion must be 2 to 1. Apply the tack coat at a rate from 0.08 to 0.15 gal/sq yd. The exact rate must be authorized.

You determine the grade of slow-setting or quick setting asphaltic emulsion to be used.

37-3.03C Construction

37-3.03C(1) General

Reserved

37-3.03C(2) Proportioning

Field conditions may require adjustments to the proportions within the authorized mix design during construction.

37-3.03C(3) Mixing and Spreading Equipment

37-3.03C(3)(a) General

Reserved

37-3.03C(3)(b) Scratch Course Boxes

Spread the scratch courses with the same type of spreader box used to spread micro-surfacings except use an adjustable steel strike-off device instead of a final strike-off device.

37-3.03C(3)(c) Wheel Path Depression Boxes

Each wheel path depression box must have adjustable strike-off device between 5 and 6 feet wide to regulate depth. The wheel path depression box must also have devices such as hydraulic augers capable of:

1. Moving the mixed material from the rear to the front of the filling chamber
2. Guiding larger aggregate into the deeper section of the wheel path depression
3. Forcing the finer material towards the outer edges of the spreader box

37-3.03C(4) Test Strips

If micro-surfacing placement will require more than 1 day, you must construct a test strip. The test strip must be:

1. From 300 to 450 feet long
2. The same as the full production micro-surfacing
3. On 1 of the application courses specified at an authorized location

4. At the same time of day or night the full production micro-surfacing is to be applied

If multiple application courses are specified, you may construct test strips over 2 days or nights.

The Engineer evaluates the test strip after traffic has used it for 12 hours. If the Engineer determines the mix design or placement procedure is unacceptable, make modifications and construct a new test strip for the Engineer's evaluation.

37-3.03C(5) Placement

37-3.03C(5)(a) General

Reserved

37-3.03C(5)(b) Repair Wheel Path Depressions

If repairing wheel path depressions is shown in plans, fill wheel path depressions and irregularities with micro-surfacing material before spreading micro-surfacing. If the depressions are less than 0.04 foot deep, fill with a scratch course. If the depressions are 0.04 foot deep or more, fill the depressions using a wheel path depression box.

Spread scratch courses by adjusting the steel strike-off of a scratch course box until it is directly in contact with the pavement surface.

Spread micro-surfacings with a wheel path depression box leaving a slight crown at the surface. Use multiple applications to fill depressions more than 0.12 foot deep. Do not apply more than 0.12 foot in a single application.

Allow traffic to compact each filled wheel path depression for a minimum of 12 hours before placing additional micro-surfacings.

37-3.03C(5)(c) Micro-surfacing Pavement Surfaces

The micro-surfacing spread rates must be within the ranges shown in the following table:

Micro-surfacing type	Application range (lb of dry aggregate/sq yd)
Type II	10–20
Type III[a]	20–32
Type III[b]	30–32

[a]Over asphalt concrete pavement

[b]Over concrete pavement and concrete bridge decks

Within 2 hours after placement, micro-surfacings must be set enough to allow traffic without pilot cars. Protect the micro-surfacings from damage until it has set and will not adhere or be picked up by vehicle tires. Micro-surfacings must not exhibit distress from traffic such as bleeding, raveling, separation or other distresses.

37-3.03D Payment

The payment quantity for micro-surfacing is the weight determined by combining the weights of the aggregate and micro-surfacing emulsion. The payment quantity for micro-surfacing does not include the weights of added water, mineral filler, and additives.

37-3.04 RUBBERIZED AND MODIFIED SLURRY SEALS

Reserved

37-4 FOG SEALS AND FLUSH COATS

37-4.01 GENERAL

37-4.01A General

37-4.01A(1) Summary

Section 37-4.01 includes general specifications for applying fog seals and flush coats.

37-4.01A(2) Definitions

Reserved

37-4.01A(3) Submittals

At least 15 days before use, submit:

1. Sample of asphaltic emulsion in two 1-quart plastic container with lined, sealed lid
2. Asphaltic emulsion information and test data as follows:
    2.1. Supplier
    2.2. Type/Grade of asphalt emulsion
    2.3. Copy of the specified test results for asphaltic emulsion

37-4.01B Materials

Not Used

37-4.01C Construction

37-4.01C(1) General

Reserved

37-4.01C(2) Weather Conditions

Only place a fog seal or flush coat if both the pavement and ambient temperatures are at least 50 degrees F and rising. Do not place a fog seal or flush coat within 24 hours of rain or within 24 hours of forecast rain or freezing temperatures.

37-4.01D Payment

Not Used

37-4.02 FOG SEALS

37-4.02A General

37-4.02A(1) Summary

Section 37-4.02 includes specifications for applying fog seals.

Applying a fog seal includes applying a diluted slow-setting or quick setting asphaltic emulsion.

37-4.02A(2) Definitions

Reserved

37-4.02A(3) Submittals

Immediately after sampling, submit two 1-quart plastic container of asphaltic emulsion taken in the presence of the Engineer. Samples must be submitted in insulated shipping container.

37-4.02A(4) Quality Assurance

37-4.02A(4)(a) General

Reserved

37-4.02A(4)(b) Quality Control

37-4.02A(4)(b)(i) General

Reserved

37-4.02A(4)(b)(ii) Asphaltic Emulsions

Circulate asphaltic emulsions in the distributor truck before sampling. Take samples from the distributor truck at mid load or from a sampling tap or thief. Before taking samples, draw and dispose of 1 gallon. In the presence of the Engineer, take asphalt emulsion sample in two 1-quart plastic container with lined, sealed lid.

For asphaltic emulsions, the authorized laboratory must perform quality control sampling and testing at the specified frequency and location for the following quality characteristics:

Asphaltic Emulsion

Quality characteristic	Test Method	Minimum sampling and testing frequency	Sampling location
Saybolt Furol Viscosity, at 25 °C (Saybolt Furl seconds)	AASHTO T 59	Minimum 1 per day per delivery truck	Distributor truck
Sieve Test (%)			
Storage stability, 1 day (%)			
Residue by distillation (%)			
Particle charge[a]			
Tests on Residue from Distillation Test:			
Penetration, 25 °C	AASHTO T 49	Minimum 1 per day per delivery truck	Distributor truck
Ductility	AASHTO T 51		
Solubility in tricloroethylene	AASHTO T 44		

[a]If the result of the particle charge is inconclusive, the asphaltic emulsion must be tested for pH under ASTM E70. Grade QS1h asphaltic emulsion must have a minimum pH of 7.3. Grade CQS1h asphaltic emulsion must have a maximum pH of 6.7.

37-4.02A(4)(b)(iii) Asphaltic Emulsion Spread Rates

For fog seals, the authorized laboratory must perform sampling and testing at the specified frequency and location for the following quality characteristics:

Fog Seal Quality Control Requirements

Quality characteristic	Test method	Minimum sampling and testing frequency	Location of sampling
Asphaltic emulsion spread rate (gal/sq yd)	California Test 339	2 per day	Pavement surface

37-4.02A(4)(c) Department Acceptance

Fog seal acceptance is based on:

1. Visual inspection for the following:
   1.1. Uniform surface texture throughout the work limits
   1.2. Flushing consisting of the occurrence of a film of asphaltic material on the surface
   1.4 Streaking consisting of alternating longitudinal bands of asphaltic emulsion approximately parallel with the lane line
2. The Department's sampling and testing for compliance with the requirements for the quality characteristics specified in section 94 for asphaltic emulsion
3. Department's sampling and testing for compliance with the requirements for fog seal shown in the following table:

Fog Seal Acceptance Criteria

Quality Characteristic	Test Method	Requirement
Asphaltic emulsion spread rate (gal/sq yd)	California Test 339	TV ± 10%

37-4.02B Materials

You determine the grade of slow-setting or quick setting asphaltic emulsion to be used.

37-4.02C Construction

Apply asphaltic emulsions for fog seals at a residual asphalt rate from 0.02 to 0.06 gal/sq yd.

If additional water is added to the asphaltic emulsions, the resultant mixture must not be more than 1 part asphaltic emulsion to 1 part water. You determine the dilution rate.

If the fog seals become tacky, sprinkle water as required.

If fog seals and chip seals are on the same project, the joint between the seal coats must be neat and uniform.

37-4.02D Payment

The Department does not adjust the unit price for an increase or decrease in the asphaltic emulsion quantity.

37-4.03 FLUSH COATS

37-4.03A General

37-4.03A(1) Summary

Section 37-4.03 includes specifications for applying flush coats.

Applying a flush coat includes applying a fog seal coat followed by sand.

37-4.03A(2) Definitions

Reserved

37-4.03A(3) Submittals

At least 15 days before use, submit:

1. Proposed target X values for sand gradation.
2. Gradation test results for sand

Submit quality control test results for sand gradation within 2 business days of sampling.

37-4.03A(4) Quality Assurance

37-4.03A(4)(a) General

Reserved

37-4.03A(4)(b) Quality Control

For sand, the authorized laboratory must perform sampling and testing at the specified frequency and location for the following quality characteristics:

Sand Quality Control

Quality characteristic	Test method	Minimum sampling and testing frequency	Location of sampling
Gradation (% passing by weight)	California Test 202	1 per day	See California Test 125

37-4.03A(4)(c) Department Acceptance

Flush coat acceptance is based on fog seal acceptance and the following:

1. Visual inspection for uniform application of sand.
2. Sand acceptance is based on the Department's sampling and testing for compliance with the requirements shown in the following table:

Sand Gradation Acceptance Criteria

Quality characteristic	Test method	Requirement
Gradation (% passing by weight) Sieve size:	California Test 202	
3/8"		100
No. 4		93–100
No. 8		61–99
No. 16		X ± 13
No. 30		X ± 12
No. 50		X ± 9
No.100		1–15
No. 200		0–10

NOTE: "X" is the gradation that you propose to furnish for the specific sieve size.

37-4.03B Material

37-4.03B(1) General

Reserved

37-4.03B(2) Sand

Sand must be free from deleterious coatings, clay balls, roots, bark, sticks, rags, and other extraneous material.

Sand for a flush coat must comply with the gradations shown in the following table:

Sand Gradation

Quality characteristic	Test method	Requirement
Gradation (% passing by weight) Sieve size:	California Test 202	
3/8"		100
No. 4		93–100
No. 8		61–99
No. 16		X ± 13
No. 30		X ± 12
No. 50		X ± 9
No.100		1–15
No. 200		0–10

NOTE: "X" is the gradation that you propose to furnish for the specific sieve size.

Fine aggregate sizes must be distributed such that the difference between the total percentage passing the No. 16 and No. 30 sieves is from 10 to 40, and the difference between the percentage passing the No. 30 and No. 50 sieves is from 10 to 40.

37-4.03C Construction

37-4.03C(1) General

During flush coat activities, close adjacent lanes to traffic. Do not track asphaltic emulsion on existing pavement surfaces.

Apply sand immediately after applying asphaltic emulsions.

Spread sand aggregate with a mechanical device that spreads sand at a uniform rate over the full width of a traffic lane in a single application. Spread sand at a rate from 2 to 6 lb/sq yd. You determine the application rates for sand and the Engineer authorizes the application rate.

37-4.03C(2) Sweeping

Sweep loose sand material remaining on the surface 24 hours after application.

37-4.03D Payment

The Department does not adjust the unit price for an increase or decrease in the sand cover (seal) quantity.

37-5 PARKING AREA SEALS

37-5.01 GENERAL

37-5.01A Summary

Section 37-5 includes specifications for applying parking area seals. Sealing a parking area consists of spreading a mixture of asphaltic emulsion, aggregate, polymer, and water.

37-5.01B Definitions

Reserved

37-5.01C Submittals

At least 15 days before starting placement, submit a 20 lb sample of the aggregate to be used.

At least 10 days before starting placement, submit:

1. Name of the authorized laboratory to perform testing and mix design.
2. Laboratory report of test results and a proposed mix design. The report and mix design must include the specific materials to be used and show a comparison of test results and specifications. The mix design report must include the quantity of water allowed to be added at the job site. The authorized laboratory performing the tests must sign the original laboratory report and mix design.
3. Manufacturer's data for oil seal primer and polymer.

If the mix design consists of the same materials covered by a previous laboratory report, you may submit the previous laboratory report that must include material testing data performed within the previous 12 months for authorization.

If you request substitute materials, submit a new laboratory report and mix design at least 10 days before starting placement.

Submit a certificate of compliance for the parking area seal material.

Immediately after sampling, submit two 1-quart plastic containers of parking area seal taken in the presence of the Engineer. Samples must be submitted in insulated shipping containers.

37-5.01D Quality Assurance

37-5.01D(1) General

Reserved

37-5.01D(2) Quality Control

37-5.01D(2)(a) General

Reserved

37-5.01D(2)(b) Asphaltic Emulsions

For an asphaltic emulsion, the authorized laboratory must perform quality control sampling and testing at the specified frequency and location for the following quality characteristics:

Asphaltic Emulsion

Quality characteristic	Test Method	Minimum sampling and testing frequency	Sampling location
Saybolt Furol Viscosity, at 25 °C (Saybolt Furol seconds)	AASHTO T 59	Minimum 1 per day per delivery truck	Distributor truck
Sieve Test (%)			
Storage stability, 1 day (%)			
Residue by distillation (%)			
Particle charge[a]			
Tests on Residue from Distillation Test			
Penetration, 25 °C	AASHTO T 49	Minimum 1 per day per delivery truck	Distributor truck
Ductility	AASHTO T 51		
Solubility in trichloroethylene	AASHTO T 44		

[a]If the result of the particle char is inconclusive, the asphaltic emulsion must be tested for pH under ASTM E70. Grade QS1h asphaltic emulsion must have a minimum pH of 7.3. Grade CQS1h asphaltic emulsion must have a maximum pH of 6.7.

37-5.01D(2)(c) Sand

For sand, the authorized laboratory must perform sampling and testing at the specified frequency and location for the following quality characteristics:

Sand Quality Control

Quality characteristic	Test method	Minimum sampling and testing frequency	Location of sampling
Gradation (% passing by weight)	California Test 202	One per project	See California Test 125

37-5.01D(2)(d) Parking Area Seals

For a parking area seal, the authorized laboratory must perform quality control sampling and testing at the specified frequency for the following quality characteristics:

Parking Area Seal Requirements

Quality characteristic	Test method	Frequency
Mass per liter (kg)	ASTM D244	One per project
Cone penetration (mm)	California Test 413	
Nonvolatile (%)	ASTM D2042[a]	
Nonvolatile soluble in trichloroethylene (%)		
Wet track abrasion (g/m^2)	ASTM D3910	
Dried film color	--	
Viscosity (KU)[b]	ASTM D562	

[a]Weigh 10 g of homogenous material into a previously tarred, small can. Place in a constant temperature oven at 165 ± 5 °C for 90 ± 3 minutes. Cool, reweigh, and calculate nonvolatile components as a percent of the original weight.
[b]Krebs units

37-5.01D(3) Department Acceptance

Parking area seal acceptance is based on:

1. Visual inspection for:
   1.1. Uniform surface texture throughout the work limits
   1.2 Marks in the surface:
      1.2.1. Up to 4 marks in the completed parking area seal that are up to 1 inch wide and up to 6 inches long per 1,000 square feet of parking area seal placed.
      1.2.2. No marks in the completed parking area seal surface that are over 1 inch wide or 6 inches long.

1.2. Raveling consisting of the separation of the aggregate from the asphaltic emulsion
1.3. Bleeding consisting of the occurrence of a film of asphaltic material on the surface of the parking area seal
1.4 Delaminating of the parking area seal from the existing pavement
1.5 Rutting or wash-boarding

2. The Department's sampling and testing of aggregate for compliance with 100 percent passing no. 16 sieve under California Test 202
3. The Department's sampling and testing for compliance with the requirements shown in the following table:

Parking Area Seal Acceptance Criteria

Quality characteristic	Test method	Requirement
Mass per liter (min, kg)	ASTM D244	1.1
Cone penetration (mm)	California Test 413	340–700
Nonvolatile (min, %)	ASTM D2042[a]	50
Nonvolatile soluble in trichloroethylene (%)		10–35
Wet track abrasion (max, g/m^2)	ASTM D3910	380
Dried film color	--	Black
Viscosity (min, KU)[b]	ASTM D562	75

[a]Weigh 10 g of homogenous material into a previously tared, small ointment can. Place in a constant temperature oven at 165 ± 5 °C for 90 ± 3 minutes. Cool, reweigh, and calculate nonvolatile components as a percent of the original weight.
[b]Krebs units

37-5.02 MATERIALS

37-5.02A General

Aggregate must be clean, hard, durable, uncoated, and free from organic and deleterious substances. One hundred percent of the aggregate must pass the no. 16 sieve.

Asphaltic emulsion must be either Grade SS1h or CSS1h, except the values for penetration at 25 degrees C for tests on residue from distillation must be from 20 to 60.

Polymer must be either neoprene, ethylene vinyl acetate, or a blend of butadiene and styrene.

Oil seal primer must be a quick-drying emulsion with admixtures. Oil seal primer must be manufactured to isolate the parking area seal from pavement with residual oils, petroleum grease, and spilled gasoline.

Crack sealant must comply with section 37-6.

Water must be potable and not separate from the emulsion before the material is placed.

37-5.02B Mix Design

The proposed mix design for a parking area seal must comply with the requirements shown in the following table:

Parking Area Seal Mix Design Requirements

Quality characteristic	Test method	Requirement
Mass per liter (min, kg)	ASTM D244	1.1
Cone penetration (mm)	California Test 413	340–700
Nonvolatile (min, %)	ASTM D2042[a]	50
Nonvolatile soluble in trichloroethylene (%)		10–35
Wet track abrasion (max, g/m^2)	ASTM D3910	380
Dried film color	--	Black
Viscosity (min, KU)[b]	ASTM D562	75

[a]Weigh 10 g of homogenous material into a previously tarred, small ointment can. Place in a constant temperature oven at 165 ± 5 °C for 90 ± 3 minutes. Cool, reweigh, and calculate nonvolatile components as a percent of the original weight.
[b]Krebs units

A parking area seal must contain a minimum of 2 percent polymer by volume of undiluted asphaltic emulsion.

37-5.02C Proportioning

Parking area seal ingredients must be mixed at a central plant. The plant must include mechanical or electronic controls that consistently proportion the ingredients. Mix an asphaltic emulsion with the other ingredients mechanically.

Store the parking area seal in a tank equipped with mixing or agitation devices. Keep stored materials thoroughly mixed. Protect stored materials from freezing conditions.

37-5.03 CONSTRUCTION

37-5.03A General

Request that the Engineer shut off the irrigation control system at least 5 days before placing the seal. Do not water plants adjacent to the seal at least 24 hours before and after the seal coat placement.

37-5.03B Surface Preparations

If cracks in the existing pavement are from 1/4 to 1 inch wide, treat the cracks under section 37-6. Do not place the parking area seals until the Engineer determines that the crack treatments are cured.

If cracks in the existing pavement are greater than 1 inch wide, the Engineer orders the repair. This work is change order work.

After any crack treatment and before placing parking area seals, clean the pavement surface, including removal of oil and grease spots. Do not use solvents.

If cleaning the pavement with detergents, thoroughly rinse with water. Allow all water to dry before placing parking area seals.

You must seal oil and grease spots that remain after cleaning. Use an oil seal primer and comply with the manufacturer's instructions.

If the existing pavement has oil and grease spots that do not come clean and sealing is insufficient, the Engineer orders the repair of the pavement. This work is change order work.

Before placing the parking area seals, dampen the pavement surface using a distributor truck. Place the seal on the damp pavement but do not place it with standing water on the pavement.

37-5.03C Placement

If adding water at the job site based on the manufacturer's instructions for consistency and spreadability, do not exceed 15 percent by volume of undiluted asphaltic emulsion.

Place the parking area seals in 1 or more application. The seals must be uniform and smooth, free of ridges or uncoated areas.

If placing in multiple applications, allow the last application to thoroughly dry before the subsequent application.

Do not allow traffic on the parking area seals for at least 24 hours after placement.

Do not stripe over the parking area seals until it is dry.

37-5.04 PAYMENT

The payment quantity for parking area seal is the weight determined by combining the weights of the aggregate and asphaltic emulsion. The payment quantity for parking area seal does not include the added water and set-control additive.

37-6 CRACK TREATMENTS

37-6.01 GENERAL

37-6.01A Summary

Section 37-6 includes specifications for treating cracks in asphalt concrete pavement.

37-6.01B Definitions

Reserved

37-6.01C Submittals

If your selected crack treatment material is on the Authorized Material List for flexible pavement crack treatment material, submit a certificate of compliance including:

1. Manufacturer's name
2. Production location
3. Brand or trade name
4. Designation
5. Batch or lot number
6. Crack treatment material type
7. Contractor or subcontractor name
8. Contract number
9. Lot size
10. Shipment date
11. Manufacturer's signature

If your selected crack treatment material is not on the Authorized Material List for flexible pavement crack treatment material, submit a sample and test results from each batch or lot 20 days before use. Testing must be performed by an authorized laboratory and test results must show compliance with the specifications. Test reports must include the information specified for the certificate of compliance submittal. Each hot-applied crack treatment material sample must be a minimum of 3 lb and submitted in a silicone release container. Each cold-applied crack treatment material sample must be a minimum of 2 quarts and submitted in a plastic container.

At least 10 days before the start of work, submit sand gradation test results under California Test 202.

Submit the following with each delivery of crack treatment material to the job site:

1. Manufacturer's heating and application instructions
2. Manufacturer's SDS
3. Name of the manufacturer's recommended detackifying agent

37-6.01D Quality Assurance

37-6.01D(1) General

Hot-applied crack treatment material must be sampled at least once per project in the Engineer's presence. Collect two 3-pounds-minimum samples of crack treatment material from the dispensing wand into silicone release boxes.

Cold-applied crack treatment material must be sampled at least once per project in the Engineer's presence. Collect 2 samples of crack treatment material from the dispensing wand into 1-quart containers.

37-6.01D(2) Quality Control

Reserved

37-6.01D(3) Department Acceptance

Crack treatment acceptance is based on:

1. Visual inspection for uniform filling of cracks throughout the work limits including:
   1.2. Crack treatment is not more than a 1/4 inch below the specified level
   1.3. Sealant failures
   1.4. Crack re-opening
   1.5. Crack overbanding is less than 3 inches wide
2. The Department's sampling and testing for compliance with the requirements shown in the following table:

Crack Treatment Acceptance Criteria

Quality characteristic[a]	Test method[b]	Requirement				
		Type 1	Type 2	Type 3	Type 4	Type 5
Softening point (min, °C)	ASTM D36	102	96	90	84	84
Cone penetration at 77 °F (max)	ASTM D5329	35	40	50	70	90
Resilience at 77 °F, unaged (%)	ASTM D5329	20–60	25–65	30–70	35–75	40–80
Flexibility (°C)[c]	ASTM D3111	0	0	0	-11	-28
Tensile adhesion (min, %)	ASTM D5329	300	400	400	500	500
Specific gravity (max)	ASTM D70	1.25	1.25	1.25	1.25	1.25
Asphalt compatibility	ASTM D5329	Pass	Pass	Pass	Pass	Pass
Sieve test (% passing)	See note d	100	100	100	100	100

[a]Cold-applied crack treatment material residue collected under ASTM D6943, Method B and sampled under ASTM D140 must comply with the grade specified.
[b]Except for viscosity, cure each specimen at a temperature of 23 ± 2 °C and a relative humidity of 50 ± 10 percent for 24 ± 2 hours before testing.
[c]For the flexibility test, the specimen size must be 6.4 ± 0.2 mm thick by 25 ± 0.2 mm wide by 150 ± 0.5 mm long. The test mandrel diameter must be 6.4 ± 0.2 mm. The bend arc must be 180 degrees. The bend rate must be 2 ± 1 seconds. At least 4 of 5 test specimens must pass at the specified test temperature without fracture, crazing, or cracking.
[d]For hot-applied crack treatment, dilute with toluene and sieve through a no. 8 sieve. For cold-applied crack treatment, sieve the material as-received through a no. 8 sieve. If the manufacturer provides a statement that added components passed the no. 16 sieve before blending, this requirement is void.

37-6.02 MATERIALS

37-6.02A General

Reserved

37-6.02B Crack Treatment Material

A crack treatment material must comply with the requirements shown in the following table:

Crack Treatment Material

Quality characteristic[a]	Test method[b]	Requirement				
		Type 1	Type 2	Type 3	Type 4	Type 5
Softening point (min, °C)	ASTM D36	102	96	90	84	84
Cone penetration at 77 °F (max)	ASTM D5329	35	40	50	70	90
Resilience at 77 °F, unaged (%)	ASTM D5329	20–60	25–65	30–70	35–75	40–80
Flexibility (°C)[c]	ASTM D3111	0	0	0	-11	-28
Tensile adhesion (min, %)	ASTM D5329	300	400	400	500	500
Specific gravity (max)	ASTM D70	1.25	1.25	1.25	1.25	1.25
Asphalt compatibility	ASTM D5329	Pass	Pass	Pass	Pass	Pass
Sieve test (% passing)	See note d	100	100	100	100	100

[a]Cold-applied crack treatment material residue collected under ASTM D6943, Method B and sampled under ASTM D140 must comply with the grade specifications.
[b]Except for viscosity, cure each specimen at a temperature of 23 ± 2 °C and a relative humidity of 50 ± 10 percent for 24 ± 2 hours before testing.
[c]For the flexibility test, the specimen size must be 6.4 ± 0.2 mm thick by 25 ± 0.2 mm wide by 150 ± 0.5 mm long. The test mandrel diameter must be 6.4 ± 0.2 mm. The bend arc must be 180 degrees. The bend rate must be 2 ± 1 seconds. At least 4 of 5 test specimens must pass at the specified test temperature without fracture, crazing, or cracking.
[d]For hot-applied crack treatment, dilute with toluene and sieve through a no. 8 sieve. For cold-applied crack treatment, sieve the material as-received through a no. 8 sieve. If the manufacturer provides a statement that added components passed the no. 16 sieve before blending, this requirement is void.

A crack treatment material must be delivered to the job site with the information listed below. If crack treatment material is delivered to the job site in containers, each container must be marked with the following information.

1. Manufacturer's name
2. Production location
3. Brand or trade name
4. Designation
5. Crack treatment trade name
6. Batch or lot number
7. Maximum heating temperature
8. Expiration date for cold application only

Hot-applied crack treatment must be delivered to the job site premixed in cardboard containers with meltable inclusion liners or in a fully meltable package.

Cold-applied crack treatment must have a minimum shelf life of 3 months from the date of manufacture.

37-6.02C Sand

Sand applied to tacky crack treatment material must be clean, free of clay, and comply with the gradation shown in the following table:

Sand Gradation

Quality characteristic	Test method	Requirement
Gradation (% passing by weight) Sieve size:	California Test 202	
No. 4		100
No. 50		0–30
No. 200		0–5

37-6.03 CONSTRUCTION

Treat cracks from 1/4 to 1 inch in width for the entire length of the crack. Fill or repair cracks wider than 1 inch as ordered. Filling cracks wider than 1 inch is change order work.

If treating cracks on a traffic lane adjacent to a shoulder, treat the cracks on the shoulder.

For hot-applied crack treatment material, rout cracks or saw cut to form a reservoir.

Cracks must be clean and dry before treating. Before treating, blast cracks with oil-free compressed air at a pressure of at least 90 psi.

If the pavement temperature is below 40 degrees F or if there is evidence of moisture in the crack, use a hot air lance immediately before applying crack treatment. The hot air lance must not apply flame directly on the pavement.

Heat and apply hot-applied crack treatment material under with the manufacturer's instructions.

Apply cold-applied crack treatment material with a distributor kettle, a piston, or a diaphragm barrel pump that can deliver from 50 to 75 psi. The application line must have a pressure gauge and a filter. The pressure in the application line must not exceed 20 psi. The pressure gauge must have a regulator. Use a high-pressure hose with a 1/2-inch NPT swivel connection and a dispensing wand.

Apply crack treatment with a nozzle inserted into the crack. Fill the crack flush. If after 2 days the crack treatment is more than 1/4 inch below the specified level, the sealant fails, or the crack re-opens, re-treat the crack.

Immediately remove crack treatment material that is spilled or deposited on the pavement surface.

Before opening to traffic, apply sand or the manufacturer's recommended detackifying agent to tacky crack treatment material on the traveled way.

Sweep up excess sand before opening to traffic.

37-6.04 PAYMENT

The payment quantity for crack treatment is the length measured in lane miles along the edge of each paved lane parallel to the pavement's centerline. The payment for a lane includes crack treatment of the adjacent shoulder.

37-7–37-10 RESERVED

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39 ASPHALT CONCRETE

07-15-16

Replace *SP-2* at each occurrence in section 39 with:

01-15-16

MS-2

Replace the 3rd paragraph of section 39-2.01A(1) with:

07-15-16

WMA technologies must be on the Authorized Material List for WMA authorized technologies.

Add between the 3rd and 4th paragraphs of section 39-2.01A(1):

04-15-16

For HMA that uses asphalt binder containing crumb rubber modifier, submit a Crumb Rubber Usage Report form monthly and at the end of the project.

Add to the table in the 4th paragraph of section 39-2.01A(1):

01-15-16

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Add to item 8 in the 4th paragraph of section 39-2.01A(3)(b)(i):

07-15-16

, except lime supplier and source

Replace the headings and paragraphs of section 39-2.01A(3)(i) with:

01-15-16

39-2.01A(3)(i) Reserved

Replace the 2nd sentence in the 3rd paragraph of section 39-2.01A(4)(b) with:

01-15-16

Submit 3 parts and keep 1 part.

Add between *single* and *test* in the 7th paragraph of section 39-2.01A(4)(i)(i):

07-15-16

aggregate or HMA

Replace the 1st paragraph of section 39-2.01B(2)(b) with:

07-15-16

If the proposed JMF indicates that the aggregate is being treated with dry lime or lime slurry with marination, or the HMA with liquid antistrip, then testing the untreated aggregate under AASHTO T 283 and AASHTO T 324 is not required.

If HMA treatment is required or being used by the Contractor, determine the plasticity index of the aggregate blend under California Test 204.

Add between *aggregate* and *with dry lime* in the 3rd and 4th paragraphs of section 39-2.01B(2)(b):

07-15-16

blend

Replace the 9th through 11th paragraphs of section 39-2.01B(8)(a) with:

07-15-16

HMA must be produced at the temperatures shown in the following table:

HMA Production Temperatures

HMA compaction	Temperature (°F)
HMA	
Density based	≤ 325
Method	305–325
HMA with WMA technology	
Density based	240–325
Method	260–325

04-15-16

Delete the 1st paragraph of section 39-2.01B(11).

Add after the 2nd paragraph of section 39-2.01B(11):

04-15-16

For miscellaneous areas and dikes:

1. Choose the aggregate gradation from:
   1.1. 3/8-inch Type A HMA aggregate gradation
   1.2. 1/2-inch Type A HMA aggregate gradation
   1.3. 1/2-inch dike mix aggregate gradation
2. Choose asphalt binder Grade PG 64-10, PG 64-16 or PG 70-10.
3. Minimum asphalt binder content must be:
   3.1. 6.40 percent for 3/8-inch Type A HMA aggregate gradation
   3.2. 5.70 percent for 1/2-inch Type A HMA aggregate gradation
   3.3. 6.40 percent for 1/2-inch dike mix aggregate gradation

If you request and the Engineer authorizes, you may reduce the minimum asphalt binder content.

Aggregate gradation for 1/2-inch dike mix must be within the TV limits for the specified sieve size shown in the following table:

Aggregate Gradation for 1/2-inch Dike Mix
(Percentage Passing)

Sieve size	Target value limit	Allowable tolerance
3/4"	100	--
1/2"	90–95	TV ± 5
No. 4	70–75	TV ± 5
No. 8	23–25	TV ± 5
No. 50	15–35	TV ± 5
No. 200	7.0–13.0	TV ± 2.0

Replace item 4 in the 2nd paragraph of section 39-2.01C(1) with:

07-15-16

4. For method compaction:
   4.1. The temperature of the HMA and the HMA produced with WMA water injection technology in the windrow does not fall below 260 degrees F
   4.2. The temperature of the HMA produced using WMA additive technology in the windrow does not fall below 250 degrees F

07-15-16

Delete item 3 in the 8th paragraph of section 39-2.01C(1).

Replace *39-2.01A(3)(m)(iv)* in the 6th paragraph of section 39-2.01C(3)(e) with:

01-15-16

36-3.01C(3)

Replace *2.06* in the 4th paragraph of section 39-2.01C(3)(f) with:

07-15-16

2.05

Add to the end of section 39-2.01C(15)(b):

07-15-16

The compacted lift thickness must not exceed 0.25 foot.

Add between *rectangles* and *with* in the 4th paragraph of section 39-2.01C(16):

04-15-16

, half the lane width,

Add between *to* and *the* in item 1 of the 4th paragraph of section 39-2.01C(16):

04-15-16

and along

07-15-16

Delete *coat* in the 5th paragraph of section 39-2.01C(16).

Replace *37* in the 5th paragraph of section 39-2.01C(16) with:

07-15-16

37-4.02

Replace section 39-2.02A(3)(b) with:

01-15-16

The JMF must be based on the superpave HMA mix design as described in *MS-2 Asphalt Mix Design Methods* by the Asphalt Institute.

Add between the 1st and 2nd paragraphs of section 39-2.02C:

07-15-16

If the ambient air temperature is below 60 degrees F, cover the loads in trucks with tarpaulins. If the time for HMA discharge to truck at the HMA plant until transfer to paver's hopper is 90 minutes or greater and if the ambient air temperature is below 70 degrees F, cover the loads in trucks with tarpaulins, unless the time from discharging to the truck until transfer to the paver's hopper or the pavement surface is less than 30 minutes. The tarpaulins must completely cover the exposed load until you transfer the mixture to the paver's hopper or the pavement surface.

Replace the table in the 2nd paragraph of section 39-2.02C with:

07-15-16

Minimum Ambient Air and Surface Temperatures

Lift thickness (feet)	Ambient air (°F)		Surface (°F)	
	Unmodified asphalt binder	Modified asphalt binder	Unmodified asphalt binder	Modified asphalt binder
Type A HMA and Type A HMA produced with WMA water injection technology				
<0.15	55	50	60	55
≥0.15	45	45	50	50
Type A HMA produced with WMA additive technology				
<0.15	45	45	50	45
≥0.15	40	40	40	40

07-15-16

Delete the 3rd paragraph of section 39-2.02C.

Add between *HMA* and *placed* in the 1st sentence of the 4th paragraph of section 39-2.02C:

07-15-16

and Type A HMA produced with WMA water injection technology

Add between the 4th and the 5th paragraphs of section 39-2.02C:

07-15-16

For Type A HMA produced with WMA additive technology placed under method compaction, if the asphalt binder is:

1. Unmodified, complete:
   - 1.1 1st coverage of breakdown compaction before the surface temperature drops below 240 degrees F
   - 1.2. Breakdown and intermediate compaction before the surface temperature drops below 190 degrees F
   - 1.3. Finish compaction before the surface temperature drops below 140 degrees F
   - 1.4 You may continue static rolling below 140 degrees F to remove roller marks.
2. Modified, complete:
   - 2.1. 1st coverage of breakdown compaction before the surface temperature drops below 230 degrees F
   - 2.2. Breakdown and intermediate compaction before the surface temperature drops below 170 degrees F
   - 2.3. Finish compaction before the surface temperature drops below 130 degrees F
   - 2.4. You may continue static rolling below 130 degrees F to remove roller marks.

Replace the 2nd paragraph of section 39-2.03A(3)(b) with:

01-15-16

The JMF must be based on the superpave HMA mix design as described in *MS-2 Asphalt Mix Design Methods* by the Asphalt Institute.

Replace the requirement in the row for *Voids in mineral aggregate on plant produced HMA* in the 2nd table in section 39-2.03A(4)(e)(i) with:

01-15-16

18.0-23.0

Add before the 1st paragraph of section 39-2.03A(4)(e)(ii)(C):

04-15-16

CRM used must be on the Authorized Materials List for Crumb Rubber Modifier.

CRM must be a ground or granulated combination of scrap tire crumb rubber and high natural scrap tire crumb rubber, CRM must be 75.0 ± 2.0 percent scrap tire crumb rubber and 25.0 ± 2.0 percent high natural scrap tire crumb rubber by total weight of CRM. Scrap tire crumb rubber and high natural scrap tire crumb rubber must be derived from waste tires described in Pub Res Code § 42703.

Replace the row for *Hamburg wheel track* in the table in section 39-2.03B(2) with:

01-15-16

Hamburg wheel track (min, number of passes at the inflection point) Binder grade: PG 58 PG 64 PG 70	AASHTO T 324 (Modified)[d]	 10,000 12,500 15,000

Replace *RHMA-G* in the 3rd and 5th paragraphs of section 39-2.03C with:

07-15-16

RHMA-G and RHMA-G produced with WMA water injection technology

Add between the 5th and 6th paragraphs of section 39-2.03C:

07-15-16

For RHMA-G produced with WMA additive technology placed under method compaction:

1. Complete the 1st coverage of breakdown compaction before the surface temperature drops below 260 degrees F
2. Complete breakdown and intermediate compaction before the surface temperature drops below 230 degrees F
3. Complete finish compaction before the surface temperature drops below 180 degrees F
4. You may continue static rolling below 140 degrees F to remove roller marks

Replace the 6th and 7th paragraphs of section 39-2.04C with:

07-15-16

For HMA-O and HMA-O produced with WMA water injection technology:

1. With unmodified asphalt binder:
   1.1. Spread and compact only if the atmospheric temperature is at least 55 degrees F and the surface temperature is at least 60 degrees F.
   1.2. Complete the 1st coverage using 2 rollers before the surface temperature drops below 240 degrees F.
   1.3. Complete all compaction before the surface temperature drops below 200 degrees F.
2. With modified asphalt binder, except asphalt rubber binder:
   2.1. Spread and compact only if the atmospheric temperature is at least 50 degrees F and the surface temperature is at least 50 degrees F.
   2.2. Complete the 1st coverage using 2 rollers before the surface temperature drops below 240 degrees F.
   2.3. Complete all compaction before the surface temperature drops below 180 degrees F.

For HMA-O produced with WMA additive technology:

1. With unmodified asphalt binder:
   1.1. Spread and compact only if the atmospheric temperature is at least 45 degrees F and the surface temperature is at least 50 degrees F.
   1.2. Complete the 1st coverage using 2 rollers before the surface temperature drops below 230 degrees F.
   1.3. Complete all compaction before the surface temperature drops below 190 degrees F.
2. With modified asphalt binder, except asphalt rubber binder:
   2.1. Spread and compact only if the atmospheric temperature is at least 40 degrees F and the surface temperature is at least 40 degrees F.
   2.2. Complete the 1st coverage using 2 rollers before the surface temperature drops below 230 degrees F.

2.3. Complete all compaction before the surface temperature drops below 170 degrees F.

Replace *RHMA-O and RHMA-O-HB* in the 8th paragraph of section 39-2.04C with:

07-15-16

RHMA-O and RHMA-O produced with WMA water injection technology, and RHMA-O-HB and RHMA-O-HB produced with WMA water injection technology

Add between the 8th and 9th paragraphs of section 39-2.04C:

07-15-16

For RHMA-O produced with WMA additive technology and RHMA-O-HB produced with WMA additives technology:

1. Spread and compact if the ambient air temperature is at least 45 degrees F and the surface temperature is at least 50 degrees F
2. Complete the 1st coverage using 2 rollers before the surface temperature drops below 270 degrees F
3. Complete all compaction before the surface temperature drops below 240 degrees F

Add to the 2nd paragraph of section 39-2.05A(3)(b):

01-15-16

The material transfer vehicle must receive HMA directly from the truck.

Replace *Table 6.1* at each occurrence in the table in section 39-2.05B(2) with:

01-15-16

Table 8.1

Replace *SP-2 Asphalt Mixture* in the 1st footnote in the table in the 2nd paragraph of section 39-2.05B(2)(b) with:

01-15-16

MS-2 Asphalt Mix Design Methods

Replace *Manual Series No. 2 (MS-2)* in the 1st footnote in the table in the 2nd paragraph of section 39-2.05B(2)(b) with:

01-15-16

MS-2 Asphalt Mix Design Methods

Replace *39-3.05* in the 1st paragraph of section 39-3.04A with:

01-15-16

39-3.04

Add to the end of section 39-3.04A:

07-15-16

Schedule cold planing activities such that the pavement is cold planed, the HMA is placed, and the area is opened to traffic during the same work shift.

07-15-16

Delete the 2nd sentence of the 1st paragraph in section 39-3.04C(4).

Replace *39-3.06* in the 1st paragraph of section 39-3.05A with:

01-15-16

39-3.05

^^

DIVISION VI STRUCTURES

47 EARTH RETAINING SYSTEMS

07-15-16

Replace the 6th paragraph in section 47-2.02A with:

07-15-16

Rock for rock slope protection at drain pipe outlets must be small-rock slope protection and must comply with the gradation specified for 7-inch-thick layer in section 72-4.02.

^^

49 PILING

07-15-16

04-15-16

Delete the 2nd paragraph of section 49-1.01A.

Replace the 1st sentence in the 5th paragraph of section 49-1.01D(3) with:

07-15-16

Load test and anchor piles must comply with the specifications for piling as described and Class N steel pipe piling.

Add to the list in 7th paragraph of section 49-1.01D(3):

07-15-16

5. Welds that connect the anchor pile and the anchor pile head must be tested under section 49-2.02A(4)(b)(iii)(C)

Replace the 10th paragraph of section 49-1.01D(3) with:

07-15-16

Furnish labor, materials, tools, equipment, and incidentals as required to assist the Department in the transportation, installation, operation, and removal of Department-furnished steel load test beams, jacks, bearing plates, drills, and other test equipment. This is change order work.

Replace the 7th paragraph of section 49-1.01D(4) with:

07-15-16

Piles to be dynamically monitored must:

1. Have an additional length of 2 times the pile diameter plus 2 feet.
2. Be available to the Department at least 2 business days before driving.
3. Be safely supported at least 6 inches off the ground in a horizontal position on at least 2 support blocks. If requested, rotate the piles on the blocks.
4. Be positioned such that the Department has safe access to the entire pile length and circumference for the installation of anchorages and control marks for monitoring.

07-15-16

Delete *business* in item 6 in the list in the 8th paragraph of section 49-1.01D(4).

Add to the list in 9th paragraph of section 49-1.01D(4):

07-15-16

3. Cut pile to the specified cut-off elevation after bearing acceptance criteria is provided by the Department

04-15-16

Delete the 3rd paragraph of section 49-1.03.

04-15-16

Delete the 2nd paragraph of section 49-1.04.

01-15-16

Delete the 4th paragraph of section 49-2.01C(5).

Replace item 3 in the list in the 2nd paragraph of section 49-3.01A with:

07-15-16

3. CISS concrete piles

Add between *undisturbed material* and *in a dry* in the 1st paragraph of section 49-3.01C:

07-15-16

, casing, or steel shell

Replace the 2nd and 3rd paragraphs of section 49-3.01C with:

07-15-16

Place and secure reinforcement. Securely block the reinforcement to provide the minimum clearance shown between the reinforcing steel cage and the sides of the drilled hole, casing, or steel shell.

Steel shells, casings, and drilled holes must be clean and free of debris before reinforcement and concrete are placed.

Replace *dewatered* in the 4th paragraphs of section 49-3.01C with:

07-15-16

drilled

Add to section 49-3.02A(1):

07-15-16

Permanent steel casing and driven steel shell must comply with section 49-2.02.

Replace the paragraph of section 49-3.02A(2) with:

07-15-16

dry hole: A drilled hole that requires no work to keep it free of water.

dewatered hole: A drilled hole that:

1. Accumulates no more than 12 inches of water at the bottom during a 1 hour period without any pumping from the hole.

2. Has no more than 3 inches of water at the bottom immediately before placing concrete.
3. Does not require temporary casing to control the groundwater.

Replace item 8 in the list in the 1st paragraph of section 49-3.02A(3)(b) with:

07-15-16

8. Drilling plan and sequence
9. Concrete sequence and placement plan
10. If inspection pipes are required, methods for ensuring the inspection pipes remain straight, undamaged, and properly aligned during concrete placement

Replace *1 business day* in the paragraph of section 49-3.02A(3)(d) with:

07-15-16

2 business days

Add to section 49-3.02A(3)(d):

07-15-16

The log must:

1. Show the pile location, tip elevation, cutoff elevation, dates of excavation and concrete placement, total quantity of concrete placed, length and tip elevation of any casing, and details of any hole stabilization method and materials used.
2. Include an 8-1/2 by 11 inch graph of concrete placed versus depth of hole filled as follows:
   2.1. Plot the graph continuously throughout concrete placement. Plot the depth of drilled hole filled vertically with the pile tip at the bottom and the quantity of concrete placed horizontally.
   2.2. Take readings at each 5 feet of pile depth, and indicate the time of the reading on the graph.

Add after the sentence in the paragraph of section 49-3.02A(3)(e):

07-15-16

Allow 10 days for the review.

Replace the 3rd sentence in the paragraph of section 49-3.02A(3)(f) with:

07-15-16

Allow 10 days for the review and analysis of this report.

Add after *rejected pile* in the 1st sentence in the 1st paragraph of section 49-3.02A(3)(g):

07-15-16

to be mitigated

07-15-16

Delete the 2nd paragraph of section 49-3.02A(3)(g).

Replace item 3 in the list in the 3rd paragraph of section 49-3.02A(3)(g) with:

07-15-16

3. Step by step description of the mitigation work to be performed, including drawings if necessary. If the *ADSC Standard Mitigation Plan* is an acceptable mitigation method, include the most recent version. For the most recent version of the *ADSC Standard Mitigation Plan*, go to:
   http://www.dot.ca.gov/hq/esc/geotech/ft/adscmitplan.htm

Replace the 2nd sentence in the paragraph of section 49-3.02A(3)(i) with:

07-15-16

Allow 10 days for the review.

Add to section 49-3.02A(3):

07-15-16

49-3.02A(3)(j) Certifications

If synthetic slurry is used, submit as an informational submittal the names and certifications of your employees who are trained and certified by the synthetic slurry manufacturer.

Add after *excavated hole* in the 1st sentence in the 3rd paragraph of section 49-3.02A(4)(c):

07-15-16

lined with plastic

Replace the 1st paragraph of section 49-3.02A(4)(d)(i) with:

07-15-16

Section 49-3.02A(4)(d) applies to CIDH concrete piles except for piles (1) less than 24 inches in diameter or (2) constructed in dry or dewatered holes.

Replace *gamma-gamma logging* in the 2nd paragraph of section 49-3.02A(4)(d)(i) with:

07-15-16

GGL

Replace the 1st sentence in the 3rd paragraph of section 49-3.02A(4)(d)(i) with:

07-15-16

After notification by the Engineer of pile acceptance, fill the inspection pipes and cored holes with grout.

Replace *gamma-gamma logging* in section 49-3.02A(4)(d)(ii) with:

07-15-16

GGL

Replace the 3rd and 4th paragraphs of section 49-3.02A(4)(d)(iii) with:

07-15-16

The Department may perform CSL to determine the extent of the anomalies identified by GGL and to further evaluate a rejected pile for the presence of anomalies not identified by GGL. The pile acceptance test report will indicate if the Department intends to perform CSL and when the testing will be performed. Allow the Department 20 additional days for a total of 50 days to perform CSL and to provide supplemental results.

If authorized, you may perform testing on the rejected pile.

07-15-16

Delete the 8th paragraph of section 49-3.02A(4)(d)(iii).

Add to the end of section 49-3.02A(4)(d)(iii):

07-15-16

If the Engineer determines it is not feasible to repair the rejected pile, submit a mitigation plan for replacement or supplementation of the rejected pile.

Add to section 49-3.02A(4):

07-15-16

49-3.02A(4)(e) Certifications

If synthetic slurry is used, your employees who will be providing technical assistance in the slurry activities must be trained and certified by the synthetic slurry manufacturer to show their competency to perform inspection of slurry operations.

Replace section 49-3.02B(4) with:

07-15-16

49-3.02B(4) Reserved

Replace *near* in the 3rd, 4th, and 5th paragraphs of section 49-3.02B(6)(b) with:

07-15-16

within 2 feet of

Replace *twice per shift* in item 2 in the 3rd paragraph of section 49-3.02B(6)(b) with:

07-15-16

every 4 hours

07-15-16

Delete the 7th and 8th paragraphs of section 49-3.02B(6)(b).

07-15-16

Delete the 3rd paragraph of section 49-3.02B(6)(c).

Replace *near* in item 2 in the 4th paragraph of section 49-3.02B(6)(c) with:

07-15-16

within 2 feet of

Replace item 5 in the 4th paragraph of section 49-3.02B(6)(c) with:

07-15-16

5. After final cleaning and immediately before placing concrete.

Replace section 49-3.02B(9) with:

07-15-16

49-3.02B(9) Inspection Pipes

Inspection pipes must be schedule 40 PVC pipe complying with ASTM D1785 with a nominal pipe size of 2 inches.

Watertight PVC couplers complying with ASTM D2466 are allowed to facilitate pipe lengths in excess of those commercially available.

Add to the beginning of section 49-3.02C(1):

07-15-16

Unless otherwise authorized, drilling the hole and placing reinforcement and concrete in the hole must be performed in a continuous operation.

Replace the 5th paragraph of section 49-3.02C(2) with:

07-15-16

If slurry is used during excavation, maintain the slurry level at a height required to maintain a stable hole, but not less than 10 feet above the piezometric head.

Replace the 1st sentence in the 9th paragraph of section 49-3.02C(2) with:

07-15-16

Remove water that has infiltrated the dewatered hole before placing concrete, as required for dewatered hole.

Replace the 1st sentence in the 10th paragraph of section 49-3.02C(2) with:

07-15-16

If authorized, to control caving or water seepage, you may enlarge portions of the hole, backfill the hole with slurry cement backfill, concrete, or other material, and redrill the hole to the diameter shown.

Replace the 4th paragraph of section 49-3.02C(3) with:

07-15-16

Remove the temporary casing during concrete placement. Maintain the concrete in the casing at a level required to maintain a stable hole, but not less than 5 feet above the bottom of the casing, to prevent displacement of the concrete by material from outside the casing.

Replace the 5th paragraph of section 49-3.02C(4) with:

07-15-16

For a single CIDH concrete pile supporting a column:

1. If the pile and the column share the same reinforcing cage diameter, this cage must be accurately placed as shown
2. If the pile reinforcing cage is larger in diameter than the column cage:
    2.1. Maintain a clear horizontal distance of at least 3.5 inches between the two cages, if the concrete is placed under dry conditions
    2.2. Maintain a clear horizontal distance of at least 5 inches between the two cages if the concrete is placed under slurry
    2.3. The offset between the centerlines of the two cages must not exceed 6 inches

Replace the paragraphs in section 49-3.02C(5) with:

07-15-16

For acceptance testing, install and test vertical inspection pipes as follows:

1. Log the location of the inspection pipe couplers with respect to the plane of pile cutoff.
2. Cap each inspection pipe at the bottom. Extend the pipe from 3 feet above the pile cutoff to the bottom of the reinforcing cage. Provide a temporary top cap or similar means to keep the pipes clean before testing. If pile cutoff is below the ground surface or working platform, extend inspection pipes to 3 feet above the ground surface or working platform.
3. If any changes are made to the pile tip, extend the inspection pipes to the bottom of the reinforcing cage.
4. Install inspection pipes in a straight alignment and parallel to the main reinforcement. Securely fasten inspection pipes in place and provide protective measures to prevent misalignment or damage to the inspection pipes during installation of the reinforcement and placement of concrete in the hole. Construct CIDH concrete piles such that the relative distance of inspection pipes to vertical steel reinforcement remains constant.
5. After concrete placement is complete, fill inspection pipes with water to prevent debonding of the pipe.
6. Provide safe access to the tops of the inspection pipes.

7. After placing concrete and before requesting acceptance testing, test each inspection pipe in the Engineer's presence by passing a rigid cylinder through the length of pipe. The rigid cylinder must be 1-1/4-inch diameter by 4.5-foot long, weigh 12 pounds or less, and be able to freely pass down through the entire length of the pipe under its own weight and without the application of force.
8. When performing acceptance testing, inspection pipes must provide a 2-inch-diameter clear opening and be completely clean, unobstructed, and either dry or filled with water as authorized.
9. After acceptance testing is complete, completely fill the inspection pipes with water.

If the rigid cylinder fails to pass through the inspection pipe:

1. Completely fill the inspection pipes in the pile with water immediately.
2. Core a nominal 2-inch-diameter hole through the concrete for the entire length of the pile for each inspection pipe that does not pass the rigid cylinder. Coring must not damage the pile reinforcement.
3. Locate cored holes as close as possible to the inspection pipes they are replacing and no more than 5 inches clear from the reinforcement.

Core holes using a double wall core barrel system with a split tube type inner barrel. Coring with a solid type inner barrel is not allowed.

Coring methods and equipment must provide intact cores for the entire length of the pile.

Photograph and store concrete cores as specified for rock cores in section 49-1.01D(5).

The coring operation must be logged by an engineering geologist or civil engineer licensed in the State and experienced in core logging. Coring logs must comply with the Department's *Soil and Rock Logging, Classification, and Presentation Manual* for rock cores. Coring logs must include core recovery, rock quality designation of the concrete, locations of breaks, and complete descriptions of inclusions and voids encountered during coring.

The Department evaluates the portion of the pile represented by the cored hole based on the submitted coring logs and concrete cores. If the Department determines a pile is anomalous based on the coring logs and concrete cores, the pile is rejected.

Replace item 2 in the list in the 2nd paragraph of section 49-3.02C(7) with:

07-15-16

2. Extend at least 5 feet below the construction joint. If placing casing into rock or a dry hole, the casing must extend at least 2 feet below the construction joint.

Add to the beginning of section 49-3.02C(9):

07-15-16

49-3.02C(9)(a) General

Replace the 2nd sentence of the 3rd paragraph of section 49-3.02C(9) with:

04-15-16

Do not vibrate the concrete.

Add after *concrete pump* in the 8th paragraph of section 49-3.02C(9):

07-15-16

and slurry pump

Replace item 3 in the list in the 11th paragraph of section 49-3.02C(9) with:

07-15-16

3. Maintain the slurry level at a height required to maintain a stable hole, but not less than 10 feet above the piezometric head.

Replace the 13th paragraph of section 49-3.02C(9) with:

07-15-16

Maintain a log of concrete placement for each drilled hole.

Replace 14th and 15th paragraphs of section 49-3.02C(9) with:

07-15-16

If a temporary casing is used, maintain concrete placed under slurry at a level required to maintain a stable hole, but not less than 5 feet above the bottom of the casing. The withdrawal of the casing must not cause contamination of the concrete with slurry.

The equivalent hydrostatic pressure inside the casing must be greater than the hydrostatic pressure on the outside of the casing to prevent intrusion of water, slurry, or soil into the column of freshly placed concrete.

Remove scum, laitance, and slurry-contaminated concrete from the top of the pile.

Add to section 49-3.02C(9):

07-15-16

49-3.02C(9)(b) Mineral Slurry

Remove any caked slurry on the sides or bottom of hole before placing reinforcement.

If concrete is not placed immediately after placing reinforcement, the reinforcement must be removed and cleaned of slurry, the sides of the drilled hole must be cleaned of caked slurry, and the reinforcement again placed in the hole for concrete placement.

49-3.02C(9)(c) Synthetic Slurry

A manufacturer's representative must:

1. Provide technical assistance for the use of their material
2. Be at the job site before introduction of the synthetic slurry into the drilled hole
3. Remain at the job site until released by the Engineer

After the manufacturer's representative has been released by the Engineer, your employee certified by the manufacturer must be present during the construction of the pile under slurry.

Replace the heading of section 49-3.03 with:

07-15-16

CAST-IN-STEEL SHELL CONCRETE PILING

Replace the 1st paragraph of section 49-3.03A(1) with:

07-15-16

Section 49-3.03 includes specifications for constructing CISS concrete piles consisting of driven open-ended or closed-ended steel shells filled with reinforcement and concrete.

Add to the end of section 49-3.03A(1):

07-15-16

CISS concrete piles include Class 90 Alternative V and Class 140 Alternative V piles.

Add to section 49-3.03A(3):

01-15-16

Submit a Pile and Driving Data Form under section 49-2.01A(3)(a) if specified in the special provisions.

Replace the paragraph of section 49-3.03D with:

07-15-16

Furnish piling is measured along the longest side of the pile from the specified tip elevation shown to the plane of pile cutoff.

Replace section 49-4.03 with:

01-15-16

49-4.03 CONSTRUCTION

49-4.03A General

Reserved

49-4.03B Drilled Holes

Drill holes for steel soldier piles into natural foundation material. Drilled holes must be accurately located, straight, and true.

Furnish and place temporary casings or tremie seals where necessary to control water or to prevent caving of the hole.

Before placing the steel soldier pile, remove loose materials existing at the bottom of the hole after drilling operations have been completed.

Do not allow surface water to enter the hole. Remove all water in the hole before placing concrete.

If temporary casings are used, they must comply with section 49-3.02C(3).

49-4.03C Steel Soldier Piles

Plumb and align the pile before placing concrete backfill and lean concrete backfill. The pile must be at least 2 inches clear of the sides of the hole for the full length of the hole to be filled with concrete backfill and lean concrete backfill. Ream or enlarge holes that do not provide the clearance around steel piles.

Maintain alignment of the pile in the hole while placing backfill material.

Clean and prepare piles in anticipated heat affected areas before splicing steel piles or welding concrete anchors.

^^

50 PRESTRESSING CONCRETE

07-15-16

Add to the end of section 50-1.01C:

07-15-16

50-1.01C(8) Post-tensioning Jack Calibration Chart

Submit the post-tensioning jack calibration plot.

50-1.01C(9) Pretensioning Jack Calibration Chart

For any pretensioning jack calibrated by an authorized laboratory, submit a certified calibration plot.

Replace section 50-1.01D(2)(b) with:

07-15-16

50-1.01D(2)(b) Equipment and Calibration

50-1.01D(2)(b)(i) General

Each jack body must be permanently marked with the ram area.

Each pressure gauge must be fully functional and have an accurately reading, clearly visible dial or display. The dial must be at least 6 inches in diameter and graduated in 100 psi increments or less.

Each load cell must be calibrated and have an indicator that can be used to determine the force in the prestressing steel.

The range of each load cell must be such that the lower 10 percent of the manufacturer's rated capacity is not used in determining the jacking force.

Each jack must be calibrated equipped with its gauges.

Mechanically calibrate the gauges with a dead weight tester or other authorized means before calibration of the jacking equipment.

50-1.01D(2)(b)(ii) Post-tensioning

Equip each hydraulic jack used to tension prestressing steel with 2 pressure gauges or 1 pressure gauge and a load cell. Only 1 pressure gauge must be connected to the jack during stressing.

Each jack used to tension prestressing steel permanently anchored at 25 percent or more of its specified minimum ultimate tensile strength must be calibrated by METS within 1 year of use and after each repair. You must:

1. Schedule the calibration of the jacking equipment with METS.
2. Verify that the jack and supporting systems are complete, with proper components, and are in good operating condition.
3. Provide labor, equipment, and material to (1) install and support the jacking and calibration equipment and (2) remove the equipment after the calibration is complete.
4. Plot the calibration results.

Each jack used to tension prestressing steel permanently anchored at less than 25 percent of its specified minimum ultimate tensile strength must be calibrated by an authorized laboratory within 180 days of use and after each repair.

50-1.01D(2)(b)(iii) Pretensioning

Each jack used to pretension prestressing steel must be calibrated, equipped with its gauges, by a laboratory on the Authorized Laboratory List within 1 year of use and after each repair.

Calibrate pretensioning jacks:

1. Under ASTM E4 using an authorized laboratory. Certification that the calibration is performed to ASTM accuracy is not required.
2. In the presence of the Engineer. Notify the Engineer at least 2 business days before calibrating the jack.
3. Using 3 test cycles. Average the forces from each test cycle at each increment.
4. To cover the load range used in the work.

Gauges for pretensioning jacks may:

1. Be electronic pressure indicators that display either:
   1.1. Pressure in 100 psi increments or less
   1.2. Load to 1 percent of the maximum sensor/indicator capacity or 2 percent of the maximum load applied, whichever is smaller
2. Have a dial less than 6 inches in diameter

Gauges displaying pressure must have been calibrated within 1 year of the jack calibration.

Each hydraulic jack used for pretensioning must be equipped with either 2 gauges or 1 gauge and a load cell or you must have a calibrated standby jack with its gauge present on site during stressing.

^^

51 CONCRETE STRUCTURES

07-15-16

Add to the list in the 2nd paragraph of section 51-1.01A:

04-15-16

8. Pile extensions

07-15-16

9. Drainage inlets

Add to the list in the 6th paragraph of section 51-1.01A:

07-15-16

7. Drainage inlets

Add to section 51-1.02I:

07-15-16

Metal frames, covers, grates, and other miscellaneous iron and steel used with drainage inlets must comply with section 75-2.

Add to section 51-1.03B:

07-15-16

You may use PC drainage inlets as an alternative to CIP drainage inlets.

Add between the 10th and 11th paragraphs of section 51-1.03C(2)(a):

07-15-16

For drainage inlets, extend the outside forms at least 12 inches below the top of the inlet. You may place concrete against excavated earth below this depth except:

1. You must use full-depth outside forms or other protection when work activities or unstable earth may cause hazardous conditions or contamination of the concrete.
2. You must increase the wall thickness 2 inches if placing concrete against the excavated surface. The interior dimensions must be as shown.

Add to section 51-1.03C(2)(b):

07-15-16

For drainage inlets, remove exterior forms to at least 12 inches below the final ground surface. Exterior forms below this depth may remain if their total thickness is not more than 1 inch.

Add to the list in the 2nd paragraph of section 51-1.03F(2):

07-15-16

4. Interior and top surfaces of drainage inlets

Add to section 51-1.04:

07-15-16

The payment quantity for structural concrete, drainage inlet is the volume determined from the dimensions shown for CIP drainage inlets.

Add to section 51-4.01C(1):

07-15-16

For PC drainage inlets, submit field repair procedures and a patching material test sample before repairs are made. Allow 10 days for the Engineer's review.

Add to section 51-4.01C(2)(a):

07-15-16

For drainage inlets with oval or circular cross sections, submit shop drawings with calculations. Shop drawings and calculations must be sealed and signed by an engineer who is registered as a civil engineer in the State. Allow 15 days for the Engineer's review.

Add to section 51-4.01D(3):

07-15-16

The Engineer may reject PC drainage inlets exhibiting any of the following:

1. Cracks more than 1/32 inch wide
2. Nonrepairable honeycombed or spalled areas of more than 6 square inches
3. Noncompliance with reinforcement tolerances or cross sectional area shown
4. Wall, inlet floor, or lid less than minimum thickness
5. Internal dimensions less than dimensions shown by 1 percent or 1/2 inch, whichever is greater
6. Defects affecting performance or structural integrity

Add to section 51-4.02C:

07-15-16

Materials for PC drainage inlets must comply with the following:

1. Preformed flexible joint sealant must be butyl-rubber complying with ASTM C990
2. Resilient connectors must comply with ASTM C923
3. Sand bedding must comply with section 19-3.02F(2)
4. Bonding agents must comply with ASTM C1059/C1059, Type II

Add to section 51-4.02D:

07-15-16

51-4.02D(8) Drainage Inlets

PC units for drainage inlets must be rectangular, round, or oval in cross section, or any combination. Transitions from a rectangular grate opening to a round or oval basin must be made in not less than 8 inches. Provide means for field adjustment to meet final grade, paving, or surfacing.

If oval or circular shape cross-sections are furnished, they must comply with *AASHTO LRFD Bridge Design Specifications, Sixth Edition with California Amendments*.

Wall and slab thicknesses may be less than the dimensions shown by at most 5 percent or 3/16 inch, whichever is greater.

Reinforcement placement must not vary more than 1/2 inch from the positions shown.

Add to section 51-4.03:

07-15-16

51-4.03H Drainage Inlets

Repair PC drainage inlet sections to correct damage from handling or manufacturing imperfections before installation.

Center pipes in openings to provide a uniform gap. Seal gaps between the pipe and the inlet opening with nonshrink grout under the grout manufacturer's instructions. For systems designated as watertight, seal these gaps with resilient connectors.

Match fit keyed joints to ensure uniform alignment of walls and lids. Keys are not required at the inlet floor level if the floor is precast integrally with the inlet wall. Seal keyed joint locations with preformed butyl rubber joint sealant. You may seal the upper lid and wall joint with nonshrink grout.

Clean keyed joint surfaces before installing sealant. Joint surfaces must be free of imperfections that may affect the joint. Use a primer if surface moisture is present. Use a sealant size recommended by the sealant manufacturer. Set joints using sealant to create a uniform bearing surface.

Flat drainage inlet floors must have a field-cast topping layer at least 2 inches thick with a slope of 4:1 (horizontal:vertical) toward the outlet. Use a bonding agent when placing the topping layer. Apply the bonding agent under the manufacturer's instructions.

Replace the 2nd paragraph of section 51-7.01A with:

07-15-16

Minor structures include structures described as minor structures.

07-15-16

Delete the 4th paragraph of section 51-7.01B.

07-15-16

Delete the 1st and 3rd paragraphs of section 51-7.01C.

07-15-16

Delete the heading and paragraph of section 51-7.02.

^^

52 REINFORCEMENT

01-15-16

Replace the 3rd paragraph of section 52-6.03B with:

01-15-16

For uncoated and galvanized reinforcing bars complying with ASTM A615/A615M, Grade 60, ASTM A706/A706M, or ASTM A767/A767M, Class 1, the length of lap splices must be at least:

1. 45 diameters of the smaller bar spliced for reinforcing bars no. 8 or smaller
2. 60 diameters of the smaller bar spliced for reinforcing bars nos. 9, 10, and 11

For epoxy-coated reinforcing bars and alternatives to epoxy-coated reinforcing bars complying with ASTM A775/A775M, ASTM A934/A934M, ASTM A1035/A1035M, or ASTM A1055/A1055M, the length of lap splices must be at least:

1. 65 diameters of the smaller bar spliced for reinforcing bars no. 8 or smaller
2. 85 diameters of the smaller bar spliced for reinforcing bars nos. 9, 10, and 11

^^

53 SHOTCRETE

01-15-16

Replace *632* in item 1 in the list in the 3rd paragraph of section 53-1.02 with:

01-15-16

675

Replace item 2 in the list in the 3rd paragraph of section 53-1.02 with:

01-15-16

2. You may substitute a maximum of 30 percent coarse aggregate for the fine aggregate. Coarse aggregate must comply with section 90-1, except section 90-1.02C(4)(d) does not apply. The gradation for the coarse aggregate must comply with the gradation specified in section 90-1.02C(4)(b) for the 1/2 inch x No. 4 or the 3/8 inch x No. 8 primary aggregate nominal size.

Replace *shotcrete* in the 2nd sentence of the 4th paragraph of section 53-1.02 with:

01-15-16

concrete

^^

56 OVERHEAD SIGN STRUCTURES, STANDARDS, AND POLES

07-15-16

Replace section 56-1.01 with:

07-15-16

56-1.01 GENERAL

56-1.01A Summary

Section 56-1 includes general specifications for constructing overhead sign structures, standards, and poles.

56-1.01B Definitions

Reserved

56-1.01C Submittals

Reserved

56-1.01D Quality Assurance

56-1.01D(1) General

Reserved

56-1.01D(2) Quality Control

56-1.01D(2)(a) General

Reserved

56-1.01D(2)(b) Nondestructive Testing

56-1.01D(2)(b)(i) General

Perform NDT of steel members under AWS D1.1 and the requirements shown in the following table:

Nondestructive Testing for Steel Standards and Poles

Weld location	Weld type	Minimum required NDT
Circumferential splices around the perimeter of tubular sections, poles, and arms	CJP groove weld with backing ring	100% UT or RT
Longitudinal seam	CJP or PJP groove weld	Random 25% MT
Longitudinal seam within 6 inches of a circumferential splice	CJP groove weld	100% UT or RT
Welds attaching base plates, flange plates, pole plates, or mast arm plates to poles or arm tubes	CJP groove weld with backing ring and reinforcing fillet	t≥ 5/16 inch: 100% UT and 100% MT t< 5/16 inch: 100% MT after root weld pass and final weld pass
	External (top) fillet weld for socket-type connections	100% MT
Hand holes and other appurtenances	Fillet and PJP welds	MT full length on random 25% of all standards and poles

NOTE: t = pole or arm thickness

Nondestructive Testing for Overhead Sign Structures

Weld location	Weld type	Minimum required NDT
Base plate to post	CJP groove weld with backing ring and reinforcing fillet	100% UT and 100% MT
Base plate to gusset plate	CJP groove weld	100% UT
Circumferential splices of pipe or tubular sections	CJP groove weld with backing ring	100% UT or RT
Split post filler plate welds	CJP groove weld with backing bar	100% UT or RT
Longitudinal seam weld for pipe posts	CJP groove weld	t < 1/4 inch: 100% MT t ≥ 1/4 inch: 100% UT or RT
	PJP groove weld	Random 25% RT
Chord angle splice weld	CJP groove weld with backing bar	100% UT or RT
Truss vertical, diagonal, and wind angles to chord angles	Fillet weld	Random 25% MT
Upper junction plate to chord (cantilever type truss)	Fillet weld	Random 25% MT
Bolted field splice plates (tubular frame type)	CJP groove weld	100% UT and 100% MT
Cross beam connection plates (lightweight extinguishable message sign)	Fillet weld	Random 25% MT
Arm connection angles (lightweight extinguishable message sign)	Fillet weld	100% MT
Mast arm to arm plate (lightweight extinguishable message sign)	CJP groove weld with backing ring	t ≥ 5/16 inch: 100% UT and 100% MT t < 5/16 inch: 100% MT after root weld pass and final weld pass
Post angle to post (lightweight extinguishable message sign)	Fillet weld	100% MT
Hand holes and other appurtenances	Fillet and PJP welds	MT full length on random 25% of all sign structures

NOTE: t = pole or arm thickness

56-1.01D(2)(b)(ii) Ultrasonic Testing

For UT of welded joints with any members less than 5/16 inch thick or tubular sections less than 13 inches in diameter, the acceptance and repair criteria must comply with Clause 6.13.3.1 of AWS D1.1.

For UT of other welded joints, the acceptance and repair criteria must comply with Table 6.3 of AWS D1.1 for cyclically loaded nontubular connections.

After galvanization, perform additional inspection for toe cracks along the full length of all CJP groove welds at tube-to-transverse plate connections using UT.

When performing UT, use an authorized procedure under AWS D1.1, Annex S.

56-1.01D(2)(b)(iii) Radiographic Testing

The acceptance criteria for radiographic or real time image testing must comply with AWS D1.1 for tensile stress welds.

56-1.01D(2)(b)(iv) Longitudinal Seam Welds

The Engineer selects the random locations for NDT.

Grind the cover pass smooth at the locations to be tested.

If repairs are required in a portion of a tested weld, perform NDT on the repaired portion and on 25 percent of the untested portions of the weld. If more repairs are required, perform NDT on the entire weld.

56-1.01D(3) Department Acceptance

Reserved

Replace section 56-2.01D(2)(b) with:

07-15-16

Reserved

Replace the 2nd sentence of the 1st paragraph of section 56-2.02F with:

07-15-16

Manufactured pipe posts must comply with one of the following:

Add to the list in the 1st paragraph of section 56-2.02F:

07-15-16

4. ASTM A1085, Grade A

Replace the 2nd paragraph of section 56-2.02F with:

07-15-16

You may fabricate pipe posts from structural steel complying with ASTM A36/A36M, ASTM A709/A709M, Grade 36, or ASTM A572/A572M, Grades 42 or 50.

07-15-16

Delete the last sentence in the 1st paragraph of section 56-2.02K(2).

07-15-16

Delete the 3rd paragraph of section 56-2.02K(2).

Replace the 2nd paragraph of section 56-2.02K(4) with:

07-15-16

Safety cable at walkways must not be kinked, knotted, deformed, frayed, or spliced.

Replace the 1st sentence of the paragraph in section 56-2.02K(5) with:

07-15-16

The edges of handholes and other large post and arm openings must be ground smooth.

Replace the heading of section 56-3 with:

07-15-16

56-3 STANDARDS, POLES, PEDESTALS, AND POSTS

Replace the paragraph in section 56-3.01A with:

07-15-16

Section 56-3 includes general specifications for fabricating and installing standards, poles, pedestals, and posts.

Replace section 56-3.01B(2)(b) with:

07-15-16

Standards with handholes must comply with the following:

1. Include a UL-listed lug and 3/16-inch or larger brass or bronze bolt for attaching the bonding jumper for non-slip-base standards.
2. Attach a UL-listed lug to the bottom slip base plate with a 3/16-inch or larger brass or bronze bolt for attaching the bonding jumper for slip-base standards.

Replace the 1st sentence of the 3rd paragraph of section 56-3.01C(2)(a) with:

07-15-16

After each standard, pole, pedestal, and post is properly positioned, place mortar under the base plate.

Replace the 2nd sentence of the 4th paragraph of section 56-3.01C(2)(a) with:

07-15-16

The top of the foundation at curbs or sidewalks must be finished to curb or sidewalk grade.

Replace the 10th paragraph of section 56-3.01C(2)(a) with:

07-15-16

Except when located on a structure, construct foundations monolithically.

Replace the 13th paragraph of section 56-3.01C(2)(a) with:

07-15-16

Do not erect standards, poles, pedestals, or posts until the concrete foundation has cured for at least 7 days.

Replace the 14th paragraph in section 56-3.01C(2)(a) with:

07-15-16

The Engineer selects either the plumbing or raking technique for standards, poles, pedestals, and posts. Plumb or rake by adjusting the leveling nuts before tightening nuts. Do not use shims or similar devices. After final adjustments of both top nuts and leveling nuts on anchorage assemblies have been made and each standard, pole, pedestal, and post on the structure is properly positioned, tighten nuts as follows:

1. Tighten leveling nuts and top nuts, following a crisscross pattern, until bearing surfaces of all nuts, washers, and base plates are in firm contact.
2. Use an indelible marker to mark the top nuts and base plate with lines showing relative alignment of the nut to the base plate.
3. Tighten top nuts following a crisscross pattern:
   3.1. Additional 1/6 turn for anchor bolts greater than 1-1/2 inches in diameter.
   3.2. Additional 1/3 turn for other anchor bolts.
   3.3. Tightening tolerance for all top nuts is ± 1/8 turn.

Replace the 1st sentence of the 4th paragraph of section 56-3.01C(2)(b) with:

07-15-16

If shown, use sleeve nuts on Type 1 standards.

Add to section 56-3.01C(2)(b):

07-15-16

Spiral reinforcement must be continuous above the bottom of the anchor bolts. The top termination must be either:

1. 1'-6" lap beyond the end of pitch with a 90-degree hook extending to the opposite side of the cage, or
2. 1'-6" lap beyond the end of pitch with 2 evenly spaced authorized mechanical couplers

Replace the 1st sentence of the paragraph in section 56-3.02A(4)(b) with:

07-15-16

For cast slip bases for standards and poles with shaft lengths of 15 feet or more, perform RT on 1 casting from each lot of a maximum of 50 castings under ASTM E94.

Replace the 2nd paragraph of section 56-3.02B(1) with:

07-15-16

Material for push button posts, pedestrian barricades, and guard posts must comply with ASTM A53/A53M or ASTM A500/A500M.

Add to section 56-3.02B(1):

07-15-16

Steel pipe standards and mast arms must be hot dip galvanized after manufacturing. Remove spikes from galvanized surfaces.

Replace the 2nd paragraph of section 56-3.02B(2) with:

07-15-16

HS anchor bolts, nuts, and washers must comply with section 55-1.02D(1) and the following:

1. Bolt threads must be rolled
2. Hardness of HS anchor bolts must not exceed 34 HRC when tested under ASTM F606
3. Galvanization must be by mechanical deposition
4. Nuts must be heavy-hex type
5. Each lot of nuts must be proof load tested

Replace the 2nd sentence of the 9th paragraph of section 56-3.02B(2) with:

07-15-16

During manufacturing, properly locate the position of the luminaire arm on the arm plate to avoid interference with the cap screw heads.

Add to section 56-3.02B(3)(a):

07-15-16

Steel having a nominal thickness greater than 2 inches that is used for tube-to-transverse plate connections must have a minimum CVN impact value of 20 ft-lb at 20 degrees F when tested under ASTM E23.

Add to section 56-3.02B(3)(c):

07-15-16

The length of telescopic slip-fit splices must be at least 1.5 times the inside diameter of the exposed end of the female section.

For welds connecting reinforced handholes or box-type pole plate connections to a tubular member, the start and stop points must be at points located on a longitudinal axis of symmetry of the tube coinciding with the axis of symmetry of the hand hole or pole plate.

Replace the table in the 1st paragraph of section 56-3.02C with:

07-15-16

Slip Base Bolt Tightening Requirements

Standard type	Torque (ft-lb)
15-SB	150
15-SBF	150
30	150
31	200

Replace the 1st sentence of the 2nd paragraph of section 56-3.02C with:

07-15-16

Bolted connections attaching signal or luminaire arms to standards, poles, and posts are considered slip critical.

Add to section 56-3.06B:

07-15-16

Manufacture the mast arm from standard pipe, free from burrs. Each mast arm must have an insulated wire inlet and wood pole mounting brackets for the mast arm and tie-rod cross arm. Manufacture tie rod from structural steel and pipe.

07-15-16

Delete the 2nd paragraph of section 56-3.06C.

Replace the 1st sentence of the 3rd paragraph of section 56-3.06C with:

07-15-16

Mount the mast arm for luminaires to provide a 34-foot mounting height for a 165 W LED luminaire and a 40-foot mounting height for a 235 W LED luminaire.

^^

59 STRUCTURAL STEEL COATINGS

07-15-16

Replace *Type S* in the 2nd paragraph of section 59-1.02A with:

01-15-16

Type M or Type S

Add to the list in the 2nd paragraph of section 59-1.02B:

07-15-16

5. Manufactured abrasives.

Replace *Mineral and slag* in the 3rd paragraph of section 59-1.02B with:

07-15-16

Mineral, manufactured, and slag

07-15-16

Delete the 4th paragraph of section 59-2.01C(1).

^^

60 EXISTING STRUCTURES

07-15-16

07-15-16

Delete the 2nd sentence in the 11th paragraph of section 60-3.04B(3)(c).

^^

64 PLASTIC PIPE

07-15-16

Replace *Reserved* in section 64-3 with:

07-15-16

64-3.01 GENERAL

64-3.01A Summary

Section 64-3 includes specifications for constructing slotted plastic pipe.

Slotted plastic pipe includes structure excavation, concrete backfill, connecting new pipe to new or existing facilities, concrete collars, reinforcement, and other connecting devices.

64-3.01B Definitions

Reserved

64-3.01C Submittals

If an *or* equal slotted plastic pipe is being considered, it must be submitted 30 days before installation for approval.

If RSC is used for concrete backfill for slotted plastic pipe, submit the concrete mix design and test data from an authorized laboratory 10 days before excavating the pipe trench. The laboratory must specify the cure time required for the concrete mix to attain 2,000 psi compressive strength when tested under California Test 521.

Heel-resistant grates if specified must be submitted 30 days before installation for approval. Anchorage details must be included in the submittal.

64-3.01D Quality Assurance

Reserved

64-3.02 MATERIALS

64-3.02A General

Not Used

64-3.02B Slotted Plastic Pipes

Slotted plastic pipe must be one of the following or equal:

Slotted Plastic Pipe

12" diameter	18" diameter
Zurn Z888-12	Zurn Z888-18
ACO Qmax 350	ACO Qmax 365
ADS Duraslot-12	ADS Duraslot-18

64-3.02C Concrete Backfill

Concrete for concrete backfill for slotted plastic pipe must comply with the specifications for minor concrete. You may use RSC instead of minor concrete for concrete backfill.

If RSC is used for concrete backfill, the RSC must:

1. Contain at least 590 pounds of cementitious material per cubic yard
2. Comply with section 90-3.02A, except section 90-1 does not apply
3. Comply with section 90-2

64-3.02D Heel-Resistant Grates

Heel-resistant grate must:

1. Be designed to carry traffic loadings
2. Comply with ADA requirements
3. Be constructed of steel or cast iron
4. Be provided by the same manufacturer of the slotted plastic pipe
5. Comply with the manufacturer's instructions

64-3.02E Bar Reinforcement

Bar reinforcement must comply with ASTM A615/A615M, Grade 60 or ASTM A706/A706M, Grade 60.

64-3.02F Miscellaneous Metal

Ductile iron, nuts, bolts, and washers must comply with section 75.

64-3.02G Grout

Grout must be non-shrink grout complying with ASTM C1107/C1107M.

64-3.02H Curing Compound

Non-pigmented curing compound must comply with ASTM C309, Type 1, Class B.

64-3.02I End Caps

End cap must:

1. Be provided by the same manufacturer of the slotted plastic pipe
2. Prevent concrete backfill from entering the pipe

64-3.03 CONSTRUCTION

64-3.03A General

Cover the grate slots with heavy-duty tape or other authorized covering during paving and concrete backfilling activities to prevent material from entering the slots.

64-3.03B Preparation

Pave adjacent traffic lanes before installing slotted plastic pipes.

Excavation must comply with section 19-3.

64-3.03C Installation

Lay and join slotted plastic pipes under the pipe manufacturer’s instructions.

Lay pipes to line and grade with sections closely jointed and adequately secured to prevent separation during placement of the concrete backfill. If the pipes do not have a positive interlocking mechanism like a slot and tongue connection, secure the sections together with nuts, bolts, and washers before backfilling.

The top of slotted plastic pipes must not extend above the completed surface. Position the pipes so that the concrete backfill is flush with the surrounding grade and above the top of the grate from 1/8 to 1/4 inch.

Place channels with the male and female ends facing each other.

Place lateral support bar reinforcement on both sides of the grate slots. The support bar reinforcement must run the full length of the slots.

Anchor heel-resistant grates to the concrete backfill under the manufacturer's instructions.

64-3.03D Concrete Backfill

Wherever minor concrete is used for concrete backfill for slotted plastic pipe, do not allow traffic on top of the backfill within 7 days of placement.

Wherever RSC is used for concrete backfill for slotted plastic pipe, do not allow traffic on top of the backfill before the required cure time of 2,000 psi is achieved.

Place concrete backfill where shown.

Consolidate the concrete backfill with high-frequency internal vibrators.

Texture the concrete backfill surface with a broom or burlap drag to produce a durable skid-resistant surface.

Apply a non-pigmented curing compound to the exposed concrete backfill surface whenever the atmospheric temperature is 90 degrees F or greater after placement.

64-3.03E Transition Fittings

Use transition fittings to connect slotted plastic pipes to drainage inlets. The transition fittings must be supplied by the same pipe manufacturer.

Where welds are required in transition fittings, welds must comply with the pipe manufacturer's instructions. The completed welds must not have visible pinholes.Fill the gaps around the pipes in the inlet structure wall with non-shrink grout where the pipes connect to an existing drainage structure. Install the grout under the pipe manufacturer's instructions.

Cut the pipes as shown after the grout used to seal the transition fitting has cured for at least 24 hours.

64-3.04 PAYMENT

Slotted plastic pipe is measured along the centerline of the pipe and parallel with the slope line. If the pipe is cut to fit a structure or slope, the payment quantity is the length of pipe necessary to be placed before cutting, measured in 2-foot increments.

^^

DIVISION VII DRAINAGE FACILITIES

71 EXISTING DRAINAGE FACILITIES

01-15-16

Replace items 5 and 6 in the list in the 1st paragraph of section 71-3.01D with:

01-15-16

5. Performing postrehabilitation inspection

Add after the 4th paragraph of section 71-3.01D:

01-15-16

Record the quantity of grout that is installed and submit this quantity. The Department does not pay for grout that leaks through to the inside of the culvert. The Department does not pay for grout material that is wasted, disposed of, or remaining on hand after the completion of the work.

Replace the 2nd heading in section 71-5.03 with:

01-15-16

71-5.03B Frames, Covers, Grates, and Manholes

^^

DIVISION VIII MISCELLANEOUS CONSTRUCTION

72 SLOPE PROTECTION

07-15-16

Replace the 1st and 2nd paragraphs of section 72-2.02B with:

07-15-16

For method A and B placement and the class of RSP described, comply with the rock gradation shown in the following table:

Rock Gradation

Nominal RSP class by median particle diameter[b]		Nominal median particle weight W_{50}[c,d]	d_{15}[c] (inches)		d_{50}[c] (inches)		d_{100}[c] (inches)	Placement
Class[a]	Diameter (inches)		Min	Max	Min	Max	Max	Method
I	6	20 lb	3.7	5.2	5.7	6.9	12.0	B
II	9	60 lb	5.5	7.8	8.5	10.5	18.0	B
III	12	150 lb	7.3	10.5	11.5	14.0	24.0	B
IV	15	300 lb	9.2	13.0	14.5	17.5	30.0	B
V	18	1/4 ton	11.0	15.5	17.0	20.5	36.0	B
VI	21	3/8 ton	13.0	18.5	20.0	24.0	42.0	A or B
VII	24	1/2 ton	14.5	21.0	23.0	27.5	48.0	A or B
VIII	30	1 ton	18.5	26.0	28.5	34.5	48.0	A or B
IX	36	2 ton	22.0	31.5	34.0	41.5	52.8	A
X	42	3 ton	25.5	36.5	40.0	48.5	60.5	A
XI	46	4 ton	28.0	39.4	43.7	53.1	66.6	A

[a]For RSP Classes I–VIII, use Class 8 RSP fabric. For RSP Classes IX–XI, use Class 10 RSP fabric.
[b]Intermediate or B dimension (i.e., width) where A dimension is length and C dimension is thickness.
[c]d%, where % denotes the percentage of the total weight of the graded material.
[d]Values shown are based on the minimum and maximum particle diameters shown and an average specific gravity of 2.65. Weight will vary based on specific gravity of rock available for the project.

Replace the table in section 72-2.02C with:

07-15-16

Fabric Class

Class	Largest rock gradation class used in slope protection
8	Classes I–VIII
10	Classes IX–XI

Replace the table in the 1st paragraph of section 72-3.02C with:

07-15-16

Concreted-Rock Gradation

Nominal RSP class by median particle diameter[b]		Nominal median particle weight W_{50}[c,d] Weight[a]	d_{15}[c]		d_{50}[c]		d_{100}[c]
Class[a]	Size (inches)		Min	Max	Min	Max	Max
I	6	20 lb	3.7	5.2	5.7	6.9	12.0
II	9	60 lb	5.5	7.8	8.5	10.5	18.0
III	12	150 lb	7.3	10.5	11.5	14.0	24.0
V	18	1/4 ton	11.0	15.5	17.0	20.5	36.0
VII	24	1/2 ton	14.5	21.0	23.0	27.5	48.0

[a]Use Class 8 RSP fabric.
[b]Intermediate or B dimension (i.e., width) where A dimension is length and C dimension is thickness.
[c]d%, where % denotes the percentage of the total weight of the graded material.
[d]Values shown are based on the minimum and maximum particle diameters shown and an assumed specific gravity of 2.65. Weight will vary based on specific gravity of rock available for the project.

Replace the table in section 72-3.03E with:

07-15-16

Minimum Concrete Penetration

	Rock class				
	VII	V	III	II	I
Penetration (inches)	18	14	10	8	6

^^^

73 CONCRETE CURBS AND SIDEWALKS

07-15-16

Replace section 73-3.01A with:

07-15-16

Section 73-3 includes specifications for constructing sidewalks, gutter depressions, island paving, curb ramps, and driveways.

^^^

74 PUMPING EQUIPMENT AND CONTROLS

04-15-16

Replace *87-1.03K* in the 4th paragraph of section 74-3.03B(2) with:

04-15-16

87

^^^

80 FENCES

07-15-16

Replace section 80-4 with:

07-15-16

80-4 WILDLIFE EXCLUSION FENCES

80-4.01 GENERAL

80-4.01A General

Section 80-4 includes specifications for constructing wildlife exclusion fences.

Constructing a wildlife exclusion fence includes the installation of any signs specified in the special provisions.

80-4.01B Materials

Each T post must:

1. Comply with ASTM A702
2. Be metal and have an anchor plate
3. Be painted black or galvanized

80-4.01C Construction

Not Used

80-4.01D Payment

Not Used

80-4.02 DESERT TORTOISE FENCES

80-4.02A General

Section 80-4.02 includes specifications for constructing desert tortoise fences.

80-4.02B Materials

80-4.02B(1) Permanent Desert Tortoise Fences

80-4.02B(1)(a) General

Each wire tie and hog ring for a permanent desert tortoise fence must comply with section 80-2.02F.

Each hold down pin must:

1. Be U-shaped, with 2 minimum 6-inch long legs
2. Have pointed ends
3. Be at least 11-gauge wire
4 Be galvanized
5. Be commercial quality

80-4.02B(1)(b) Hardware Cloth

The hardware cloth must:

1. Comply with ASTM A740
2. Be welded or woven galvanized steel wire fabric
3. Be made of at least 14-gauge wire
4. Be 36 inches wide

80-4.02B(1)(c) Barbless Wire

The barbless wire must:

1. Comply with ASTM A641/A641M
2. Be at least 14-gauge wire
3. Have a Class 1 zinc coating

80-4.02B(1)(d) Posts

Each post must:

1. Comply with ASTM F1083
2. Be standard weight, schedule 40 steel pipe with a nominal pipe size of 1 inch
3. Be galvanized steel fence post conforming to ASTM A702

80-4.02B(2) Temporary Desert Tortoise Fences

The materials for a temporary desert tortoise fence must comply with section 80-4.02B(1), except the hardware cloth must be made of at least 16-gauge wire.

80-4.02C Construction

80-4.02C(1) General

Extend the hardware cloth a minimum of 24 inches above the ground.

Plumb the posts and pull the hardware cloth taut. Correct any alignment issues.

80-4.02C(2) Permanent Desert Tortoise Fences

Excavate the ground to form a trench before installing the posts and hardware cloth. Embed the posts at maximum 5-foot intervals into the ground. If T posts are used, use 5-foot lengths and embed the posts to match the above-ground height shown for the posts.

Securely fasten the hardware cloth to the posts with wire ties and to barbless wire with hog rings as shown. Pass the wire ties through the hardware cloth. Encircle the posts and barbless wire with the ties and tie them by twisting a minimum of 3 complete turns.

Bend the twisted ends of the ties down to prevent possible snagging. Close hog rings with their ends overlapping.

Bury the hardware cloth a minimum of 12 inches into the ground. Install the cloth in 1 continuous piece. You may cut the cloth into shorter segments if authorized.

Overlap the hardware cloth segments at posts, with a minimum overlap of 6 inches centered at a post. Wire tie the overlapped cloth to posts as shown. Prevent fraying by threading barbless wire along the vertical edges of the hardware cloth on either side of the post or use 3 equally spaced hog rings (6 hog rings per location) along each wire cloth edge.

Where bedrock or caliche substrate is encountered, use the bent hardware cloth detail if authorized. Transitions from buried-to-bent or bent-to-buried configuration must occur at a post location with a minimum 6-inch overlap of the hardware cloth as shown. The maximum spacing for hold down pins is 24 inches on center. Anchor in place with hold down pins the beginning and end corners of the hardware cloth placed on the ground.

Backfill the removed earth material into the trench created to install the hardware cloth and posts. Use an 8 lb or heavier hand tamper to compact the backfill around the posts and hardware cloth. Install a post at each corner of the cloth segments.

If a gate must be installed, attach the hardware cloth to the gate frame such that there is contact along the entire length of the gate between the finished ground surface and the lower edge of the cloth. Install the gate under section 80-10.

80-4.02C(3) Temporary Desert Tortoise Fences

Fold the horizontal edge of the hardware cloth at a 90° angle toward the tortoise habitat area. Ensure the clearance to the ground at the bend is from 0 to 2 inches.

Where the hardware cloth overlaps, secure the bend piece with one of the following:

1. Barbless wire threaded along the width of the cloth
2. Minimum of 4 hog rings equally spaced along the edge

Fasten the bent piece to the ground with hold down pins pushed completely into the ground.

When the temporary fence is no longer needed, compact soil into post holes with an 8 lb or heavier hand tamper.

80-4.02D Payment

Not Used

80-4.03–80-4.09 RESERVED

^^

DIVISION IX TRAFFIC CONTROL DEVICES

83 RAILINGS AND BARRIERS

04-15-16

04-15-16

Delete *to* in the 4th paragraph of section 83-1.02B.

^^

84 MARKINGS

07-15-16

Add to the beginning of section 84-8.03A:

07-15-16

Select the method and equipment for constructing ground-in indentations.

Replace the 1st paragraph of section 84-8.03A with:

07-15-16

Do not construct rumble strips:

1. On structures, approach slabs, or concrete weigh-in-motion slabs
2. At intersections
3. Bordering two-way left turn lanes, driveways, or other high-volume turning areas
4. Within 6 inches of any concrete pavement joint

Add between the 2nd and 3rd paragraphs of section 84-8.03A:

07-15-16

Modify rumble strip spacing to avoid locating a groove on a concrete pavement joint.

Replace the 3rd paragraph of section 84-8.03A with:

07-15-16

Indentations must comply with the dimensions shown and not vary more than:

1. 10 percent in length
2. 0.06 inch in depth
3. 10 percent in width
4. 1 inch in center-to-center spacing between rumble strips

Add to the end of section 84-8.03A:

07-15-16

The noise level created by the combined grinding activities must not exceed 86 dBA when measured at a distance of 50 feet at right angles to the direction of travel.

Break rumble strips before and after intersections, driveways, railroad crossings, freeway gore areas, and freeway ramps. Place breaks and break distances as shown. You may adjust breaks and the break distances as needed at low-volume driveways or other locations if authorized.

07-15-16

Delete *new* in the 1st paragraph of section 84-8.03B.

07-15-16

Add to the end of section 84-8.03B:

Remove grinding residue under section 13-4.03E(7).

Replace the 1st paragraph of section 84-8.03C with:

07-15-16

Construct rumble strips in the top layer of HMA and asphalt concrete surfacing by the ground-in method.

Add between the 2nd and 3rd paragraphs of section 84-8.03C:

07-15-16

Dispose of the removed material.

07-15-16

Delete the 2nd paragraph of section 84-8.03C.

Replace *37-2* in the 3rd paragraph of section 84-8.03C with:

07-15-16

37-4.02

Replace section 84-8.04 with:

07-15-16

The payment quantity for any type of rumble strip is the length measured by the station along the length of the rumble strip without deductions for gaps between indentations.

Replace the 2nd paragraph of section 84-9.03B with:

04-15-16

Completely remove traffic stripes and pavement markings, including any paint in the gaps, by methods that do not remove pavement to a depth of more than 1/8 inch.

Add between the 2nd and 3rd paragraphs of section 84-9.03B:

04-15-16

Submit your proposed method for removing traffic stripes and pavement markings at least 7 days before starting the removal work. Allow 2 business days for the review.

Remove pavement marking such that the old message cannot be identified. Make any area removed by grinding rectangular. Water must not puddle in the ground areas. Fog seal ground areas on asphalt concrete pavement.

04-15-16

Delete *materially* in the 1st paragraph of section 84-9.03D.

^^

DIVISION X ELECTRICAL WORK

Replace section 86 with:

04-15-16

86 GENERAL

04-15-16

86-1.01 GENERAL

86-1.01A Summary

Section 86 includes general specifications for furnishing electrical equipment and materials.

Electrical equipment and materials must comply with part 4 of the *California MUTCD* and 8 CA Code of Regs, chapter 4, subchapter 5, "Electrical Safety Orders."

Galvanized equipment and materials must comply with section 75-1.02B.

86-1.01B Definitions

accessible pedestrian signal: Accessible pedestrian signal as defined in the *California MUTCD*.

accessible walk indication: Activated audible and vibrotactile action during the walk interval.

actuation: Actuation as defined in the *California MUTCD*.

ambient sound level: Background sound level in dB at a given location.

ambient sound sensing microphone: Microphone that measures the ambient sound level in dB and automatically adjusts the accessible pedestrian signal speaker's volume.

audible speech walk message: Audible prerecorded message that communicates to pedestrians which street has the walk interval.

channel: Discrete information path.

CALiPER: Commercially Available LED Product Evaluation and Reporting. A U.S. Department of Energy program that individually tests and provides unbiased information on the performance of commercially available LED luminaires and lights.

controller assembly: Assembly for controlling a system's operations, consisting of a controller unit and auxiliary equipment housed in a waterproof cabinet.

controller unit: Part of the controller assembly performing the basic timing and logic functions.

correlated color temperature: Absolute temperature in kelvin of a blackbody whose chromaticity most nearly resembles that of the light source.

detector: Detector as defined in the *California MUTCD*.

electrolier: Assembly of a lighting standard and luminaire.

flasher: Device for opening and closing signal circuits at a repetitive rate.

flashing beacon control assembly: Assembly of switches, circuit breakers, terminal blocks, flasher, wiring, and other necessary electrical components housed in a single enclosure for operating a beacon.

house side lumens: Lumens from a luminaire directed to light up areas between the fixture and the pole, such as sidewalks at intersection or areas off the shoulders on freeways.

illuminance gradient: Ratio of the minimum illuminance on a 1-foot square of sign panel to that on an adjacent 1-foot square of sign panel.

inductive loop detector: Detector capable of being actuated by an inductance change caused by a vehicle passing or standing over the loop. An inductive loop detector includes a loop or group of loops installed in the roadway and a lead-in cable installed and connected inside a controller cabinet.

junction temperature: Temperature of the electronic junction of the LED device. The junction temperature is critical in determining photometric performance, estimating operational life, and preventing catastrophic failure of the LED.

L70: Extrapolated life in hours of the luminaire when the luminous output depreciates 30 percent from the initial values.

lighting standard: Pole and mast arm supporting the luminaire.

LM-79: Test method from the Illumination Engineering Society of North America specifying the test conditions, measurements, and report format for testing solid state lighting devices, including LED luminaires.

LM-80: Test method from the Illumination Engineering Society of North America specifying the test conditions, measurements, and report format for testing and estimating the long-term performance of LEDs for general lighting purposes.

luminaire: Assembly that houses the light source and controls the light emitted from the light source.

National Voluntary Laboratory Accreditation Program: U.S. Department of Energy program that accredits independent testing laboratories.

powder coating: Coating applied electrostatically using exterior-grade, UV-stable, polymer powder.

power factor: Ratio of the real power component to the complex power component.

pretimed controller assembly: Assembly operating traffic signals under a predetermined cycle length.

programming mechanism: Device to program the accessible pedestrian signal operation.

pull box: Box with a cover that is installed in an accessible place in a conduit run to facilitate the pulling in of wires or cables.

push button information message: Push button information message as defined in the *California MUTCD.*

push button locator tone: Push button locator tone as defined in the *California MUTCD*.

signal face: Signal face as defined in the *California MUTCD*.

signal head: Signal head as defined in the *California MUTCD*.

signal indication: Signal indication as defined in the *California MUTCD*.

signal section: Signal section as defined in the *California MUTCD*.

signal standard: Pole with or without mast arms carrying 1 or more signal faces.

street side lumens: Lumens from a luminaire directed to light up areas between the fixture and the roadway, such as traveled ways and freeway lanes.

surge protection device: Subsystem or component that protects equipment against short-duration voltage transients in power line.

total harmonic distortion: Ratio of the rms value of the sum of the squared individual harmonic amplitudes to the rms value of the fundamental frequency of a complex waveform.

traffic-actuated controller assembly: Assembly for operating traffic signals under the varying demands of traffic as registered by detector actuation.

traffic phase: Traffic phase as defined in the *California MUTCD*.

vehicle: Vehicle as defined in the *California Vehicle Code*.

vibrotactile pedestrian device: Vibrotactile pedestrian device as defined in the *California MUTCD*.

86-1.01C Submittals

86-1.01C(1) General

Within 15 days after Contract approval, submit a list of equipment and materials you propose to install.

Submit the list before shipping equipment and materials to the job site. The list must include:

1. Manufacturer's name
2. Make and model number
3. Month and year of manufacture
4. Lot and serial numbers
5. Contract number
6. Your contact information

Submit confirmation of the vendor's acceptance of the order for the electrical equipment and materials as an informational submittal.

Submit 3 sets of computer-generated, schematic wiring diagrams for each cabinet.

Diagrams, plans, and drawings must be prepared using graphic symbols in IEEE 315, "Graphic Symbols for Electrical and Electronic Diagrams."

Submit a schedule of values within 15 days after Contract approval.

Do not include costs for the traffic control system in the schedule of values.

Submit a manufacturer's maintenance manual or combined maintenance and operation manual as an informational submittal. The manual must have a master item index that includes:

1. Specifications
2. Design characteristics
3. General operation theory
4. Function of all controls
5. Troubleshooting procedure
6. Parts list, descriptions, stock numbers, and settings
7. Block circuit diagram
8. Layout of components
9. Schematic diagrams

86-1.01C(2) Pull Boxes

Submit the manufacturer's installation instructions for pull boxes, including:

1. Quantity and size of entries that can be made without degrading the strength of the pull box below the load rating
2. Locations where side entries can be made
3. Acceptable method for creating the entry

Submit load-rating test reports for pull boxes from a NRTL.

86-1.01C(3) LED Luminaires

Submit for an LED luminaire:

1. Maximum power in watts
2. Maximum designed junction temperature
3. Heat sink area in square inches

4. Designed junction-to-ambient thermal resistance calculation with thermal resistance components clearly defined
5. L70 in hours when extrapolated for the average nighttime operating temperature
6. Life expectancy based on the junction temperature
7. Manufacturer's data sheet for the power supply, including the rated life

Submit the manufacturer's QC test data for LED luminaires as an informational submittal.

86-1.01C(4) Low-Pressure Sodium Luminaires

Submit the manufacturer's QC test data for low-pressure sodium luminaires as an informational submittal.

86-1.01C(5) Service Equipment Enclosures

Submit shop drawings for a service equipment enclosure to METS.

86-1.01C(6) Signal Heads

Submit a certificate of compliance and the manufacturer's QC test data for signal heads as an informational submittal.

86-1.01C(7) LED Signal Modules

Submit the manufacturer's QC test data for LED signal modules as an informational submittal.

86-1.01C(8) Visors

Submit a certificate of compliance and the manufacturer's QC test data for visors as an informational submittal.

86-1.01C(9) LED Countdown Pedestrian Signal Face Modules

Submit the manufacturer's QC test data for LED countdown pedestrian signal face modules as an informational submittal.

86-1.01C(10) Accessible Pedestrian Signals

Submit the manufacturer's QC test data for accessible pedestrian signals as an informational submittal.

86-1.01D Quality Assurance

86-1.01D(1) General

Electrical equipment must comply with one or more of the following standards:

1. ANSI
2. ASTM
3. EIA/ECIA
4. NEMA
5. NETA
6. UL/NRTL
7. TIA

Materials must comply with:

1. FCC rules
2. ITE standards
3. NEC
4. California Electrical Code

86-1.01D(2) Source Quality Control

Service equipment enclosures and cabinets must be inspected and tested at the source.

86-1.01D(3) Department Acceptance

Deliver material and equipment for testing to METS.

Allow 30 days for testing. The Department notifies you when testing is complete.

If the Department accepts the material or equipment, you must pick it up from the test site and deliver it to the job site.

If the Department rejects material or equipment, remove it within 5 business days after you are notified it is rejected. If it is not removed within that period, the Department may remove it and ship it to you and deduct the costs of labor, material and shipping.

Resubmit a new sample and allow 30 days for retesting. The retesting period starts when the replacement material or equipment is delivered to METS.

86-1.02 MATERIALS

86-1.02A General

Anchor bolts, anchor bars or studs, and nuts and washers must comply with section 75-1.02.

Bolt threads must accept galvanized standard nuts without requiring tools or causing removal of protective coatings.

86-1.02B Conduit and Accessories

86-1.02B(1) General

Conduit and fittings must comply with the requirements shown in the following table:

Conduit and Fitting Requirements

Type	Requirement
1	Must be hot-dip galvanized rigid steel complying with UL 6 and ANSI C80.1. The zinc coating must comply with copper sulfate test requirements in UL 6. Fittings must be electrogalvanized and certified under UL 514B.
2	Must comply with requirements for Type 1 conduit and be coated with PVC or polyethylene. The exterior thermoplastic coating must have a minimum thickness of 35 mils. The internal coating must have a minimum thickness of 2 mils. Coated conduit must comply with NEMA RN 1, or NRTL PVC-001.
3	Must be Type A, extruded, rigid PVC conduit complying with UL 651 or must be HDPE conduit complying with UL 651A.
4	Must have an inner, flexible metal core covered by a waterproof, nonmetallic, sunlight-resistant jacket, and must be UL listed for use as a grounding conductor. Fittings must be certified under UL 514B.
5	Must be intermediate steel complying with UL 1242 and ANSI C80.6. The zinc coating must comply with copper sulfate test requirements specified in UL 1242. Fittings must be electrogalvanized and certified under UL 514B.

Bonding bushings installed on metal conduit must be insulated and either a galvanized or zinc-alloy type.

86-1.02B(2) Structures Accessories

Steel hangers, steel brackets, and other fittings used to support conduit in or on a wall or bridge superstructure must comply with section 75-3.

Precast concrete cradles for conduit must be made of minor concrete and commercial-quality welded wire fabric. The minor concrete must contain a minimum of 590 lb of cementitious material per cubic yard. The cradles must be moist cured for a minimum of 3 days.

86-1.02C Pull Boxes

86-1.02C(1) General

Pull box cover must have a marking on the top that is:

1. Clearly defined
2. Uniform in depth
3. Parallel to either side
4. 1 to 3 inches in height

Cover marking must be:

1. *SERVICE* for service circuits between a service point and service disconnect
2. *SERVICE IRRIGATION* for circuits from a service equipment enclosure to an irrigation controller
3. SERVICE BOOSTER PUMP for circuits from a service equipment enclosure to the booster pump
4. *TDC POWER* for circuits from a service equipment enclosure to telephone demarcation cabinet
5. *LIGHTING* for a lighting system
6. *SIGN ILLUMINATION* for a sign illumination system
7. *SIGNAL AND LIGHTING* for a signal and lighting system
8. *RAMP METER* for a ramp metering system
9. *TMS* for a traffic monitoring station
10. *FLASHING BEACON* for a flashing beacon system
11. *CMS* for a changeable message sign system
12. *INTERCONNECT* for an interconnect conduit and cable system

The load rating must be stenciled on the inside and outside of the pull box and the cover.

If a transformer or other device must be placed in the pull box, include recesses for a hanger.

The hardware must be stainless steel with 18 percent chromium and 8 percent nickel content.

86-1.02C(2) Nontraffic Pull Boxes

A nontraffic pull box and cover must comply with ANSI/SCTE 77, "Specification for Underground Enclosure Integrity," for Tier 22 load rating and must be gray or brown.

Each new pull box must have a cover with an electronic marker cast inside.

A pull box extension must be made of the same material as the pull box. The extension may be another pull box if the bottom edge of the pull box fits into the opening for the cover.

The bolts, nuts, and washers must be a captive design and galvanized. Captive bolts for securing the cover of nontraffic pull boxes must be capable of withstanding a torque from 55 to 60 ft-lb and a minimum pull-out strength of 750 lb.

86-1.02C(3) Traffic Pull Boxes

A traffic pull box and cover must comply with ASTM C857 for HS20-44 loading.

The frame must be anchored to the box with 2-1/4-inch-long concrete anchors with a 1/4 inch diameter. A no. 3-1/2(T) pull box must have 4 concrete anchors, one placed in each corner. No. 5(T) and no. 6(T) pull boxes must have 6 concrete anchors, one placed in each corner and one near the middle of each of the longer sides.

Nuts must be vibration-resistant, zinc-plated, carbon steel and have a wedge ramp at the root of the thread.

Before galvanizing a steel or cast iron cover, the manufacturer must apply the cover marking by one of the following methods:

1. Use a cast iron strip at least 1/4 inch thick with letters raised a minimum of 1/16 inch. Fasten the strip to the cover with 1/4-inch, flathead, stainless steel machine bolts and nuts. Peen the bolts after tightening.
2. Use a sheet steel strip at least 0.027 inch thick with letters raised a minimum of 1/16 inch. Fasten the strip to the cover by spot welding, tack welding, or brazing with 1/4-inch stainless steel rivets or 1/4-inch, roundhead, stainless steel machine bolts and nuts. Peen the bolts after tightening.

The steel cover must be countersunk approximately 1/4 inch to accommodate the bolt head. When tightened, the bolt head must be no more than 1/8 inch above the top of the cover.

86-1.02C(4) Reserved

86-1.02D Tapes

86-1.02D(1) General

Reserved

86-1.02D(2) Pull Tape

Pull tape must be a flat, woven, lubricated, soft-fiber, polyester tape with a minimum tensile strength of 1,800 lb. The tape must have sequential measurement markings every 3 feet.

86-1.02D(3) Reserved

86-1.02E Reserved

86-1.02F Conductors and Cables

86-1.02F(1) Conductors

86-1.02F(1)(a) General

Reserved

86-1.02F(1)(b) Reserved

86-1.02F(1)(c) Copper Conductors

86-1.02F(1)(c)(i) General

Copper wire must comply with ASTM B3 and B8.

Conductor must be clearly and permanently marked the entire length of its outer surface with:

1. Manufacturer's name or trademark
2. Insulation-type letter designation
3. Conductor size
4. Voltage
5. Temperature rating
6. Number of conductors for a cable

The minimum insulation thickness and color code requirements must comply with NEC.

A conductor must be UL listed or NRTL certified and rated for 600 V(ac).

Insulation for no. 14 to no. 4 conductors must be one of the following:

1. Type TW PVC under ASTM D2219
2. Type THW PVC
3. Type USE, RHH, or RHW cross-linked polyethylene

The insulation for no. 2 and larger conductors must be one of the above or THWN.

Conductors must be identified as shown in the following table:

Conductor Identification

Circuit	Signal phase or function	Identification			Size
		Insulation color[d]			
		Base	Stripe[a]	Band symbols	
Signals (vehicle)[a, b]	2, 6	Red, yel, brn	Blk	2, 6	14
	4, 8	Red, yel, brn	Ora	4, 8	14
	1, 5	Red, yel, brn	None	1, 5	14
	3, 7	Red, yel, brn	Pur	3, 7	14
	Ramp meter 1	Red, yel, brn	None	NBR	14
	Ramp meter 2	Red, yel, brn	Blk	NBR	14
Pedestrian signals	2p, 6p	Red, brn	Blk	2p, 6p	14
	4p, 8p	Red, brn	Ora	4p, 8p	14
	1p, 5p	Red, brn	None	1p, 5p	14
	3p, 7p	Red, brn	Pur	3p, 7p	14
Pedestrian push buttons	2p, 6p	Blu	Blk	P-2, P-6	14
	4p, 8p	Blu	Ora	P-4, P-8	14
	1p, 5p	Blu	None	P-1, P-5	14
	3p, 7p	Blu	Pur	P-3, P-7	14
Traffic signal controller cabinet	Ungrounded circuit conductor	Blk	None	CON-1	6
	Grounded circuit conductor	Wht	None	CON-2	6
Highway lighting pull box to luminaire	Ungrounded - line 1	Blk	None	NBR	14
	Ungrounded - line 2	Red	None	NBR	14
	Grounded	Wht	None	NBR	14
Multiple highway lighting	Ungrounded - line 1	Blk	None	ML1	10
	Ungrounded - line 2	Red	None	ML2	10
Lighting control	Ungrounded - PEU	Blk	None	C1	14
	Switching leg from PEU unit or SM transformer	Red	None	C2	14
Service	Ungrounded - line 1 (signals)	Blk	None	NBR	6
	Ungrounded - line 2 (lighting)	Red	None	NBR	8
Sign lighting	Ungrounded - line 1	Blk	None	SL-1	10
	Ungrounded - line 2	Red	None	SL-2	10
Flashing beacons	Ungrounded between flasher and beacons	Red or yel	None	F-Loc.[c]	14
Grounded circuit conductor	Pedestrian push buttons	Wht	Blk	NBR	14
	Signals and multiple lighting	Wht	None	NBR	10
	Flashing beacons and sign lighting	Wht	None	NBR	12
	Lighting control	Wht	None	C-3	14
	Service	Wht	None	NBR	14
Railroad preemption		Blk	None	R	14
Spares		Blk	None	NBR	14

NBR = No band required PEU=Photoelectric unit

[a]On overlaps, the insulation is striped for the 1st phase in the designation, e.g., phase (2+3) conductor is striped as for phase 2.

[b]Band for overlap and special phases as required

[c]Flashing beacons having separate service do not require banding.

[d]Color Code: Yel-Yellow, Brn-Brown, Blu-Blue, Blk-Black, Wht-White, Ora-Orange, Pur-Purple

The insulation color must be homogeneous throughout the full depth of the insulation. The identification stripe must be continuous throughout the length of the conductor.

86-1.02F(1)(c)(ii) Bonding Jumpers and Equipment Grounding Conductors

A bonding jumper must be copper wire or copper braid of the same cross-sectional area as a no. 8 conductor or larger.

An equipment grounding conductor may be bare or insulated.

86-1.02F(1)(c)(iii) Inductive Loop Conductors

Inductive loop conductor must comply with the requirements shown in the following table:

Conductor Requirements for Inductive Loop Detectors

Loop wire	Requirement
Type 1	Type RHW-USE neoprene-jacketed or Type USE cross-linked polyethylene, insulated, no. 12, stranded copper wire with a minimum 40-mils insulation thickness at any point.
Type 2	Type THWN or Type XHHW, no. 14, stranded copper wire in a plastic tubing. The plastic tubing must be polyethylene or vinyl rated for use at 105 °C and resistant to oil and gasoline. The outside diameter of the tubing must be at most 0.27 inch with a wall thickness of at least 0.028 inch.

86-1.02F(1)(d) Reserved

Reserved

86-1.02F(2) Cables

86-1.02F(2)(a) General

Reserved

86-1.02F(2)(b) Reserved

Reserved

86-1.02F(2)(c) Reserved

86-1.02F(2)(d) Copper Cables

86-1.02F(2)(d)(i) General

The conductor wire size for a detector lead-in cable must comply with the requirements of ASTM B286.

Cable, except a detector lead-in cable, must be clearly and permanently marked the entire length of its outer surface with:

1. Manufacturer's name or trademark
2. Insulation-type letter designation
3. Conductor size
4. Voltage
5. Temperature rating
6. Number of conductors for a cable

86-1.02F(2)(d)(ii) Conductors Signal Cables

A conductors signal cable must have a black polyethylene jacket with an inner polyester binder sheath. The cable jacket must be rated for 600 V(ac) and 75 degrees C. Filler material, if used, must be polyethylene.

The individual conductors in the cable must be solid copper complying with ASTM B286 with Type THWN insulation. The minimum thickness of insulation must comply with NEC for conductor sizes no. 14 to no.10. The minimum thickness of the nylon jacket must be 4 mils.

Cable must comply with the requirements shown in the following table:

Cable type[a]	Conductor quantity and type	Cable jacket thickness (mils)		Maximum nominal outside diameter (inch)	Conductor color code
		Average	Minimum		
3CSC	3 no. 14	44	36	0.40	Blue/black, blue/orange, white/black stripe
5CSC	5 no. 14	44	36	0.50	Red, yellow, brown, black, white
9CSC	8 no. 14 1 no. 12	60	48	0.65	No. 12 - white, no. 14 - red, yellow, brown, black, and red/black, yellow/black, brown/black, white/black stripe
12CSC	11 no. 14 1 no. 12	60	48	0.80	No. 12 - white, no. 14 - red, yellow, brown, red/black stripe, yellow/black stripe, brown/black stripe, black/red stripe, black/white stripe, black, red/white stripe, brown/white stripe
28CSC	27 no. 14 1 no. 10	80	64	0.90	No. 10 - white no. 14 - red/black stripe, yellow/black stripe, brown/black stripe, red/orange stripe, yellow/orange stripe, brown/orange stripe, red/silver stripe, yellow/silver stripe, brown/silver stripe, red/purple stripe, yellow/purple stripe, brown/purple stripe, red/2 black stripes, brown/2 black stripes, red/2 orange stripes, brown/2 orange stripes, red/2 silver stripes, brown/2 silver stripes, red/2 purple stripes, brown/2 purple stripes, blue/black stripe, blue/orange stripe, blue/silver stripe, blue/purple stripe, white/black stripe, black/red stripe, black

86-1.02F(2)(d)(iii) Detector Lead-in Cables

Conductors for a loop detector lead-in cable must be two no. 16, 19-by-29, stranded, tinned copper wires with calculated cross-sectional areas complying with ASTM B286, table 1 and must comply with the requirements shown in the following table:

Conductor Requirements for Loop Detector Lead-In Cables

Lead-in cable	Requirement
Type B	Insulated with 20 mils of high-density polyethylene. Conductors must be twisted together with at least 2 turns per foot, and the twisted pair must be protected with a copper or aluminum polyester shield. A minimum no. 20 copper drain wire must be connected to the equipment ground within the cabinet. Cable must have a high-density polyethylene or high-density polypropylene outer jacket with a nominal thickness of 32 mils. Include an amorphous, interior, moisture penetration barrier of nonhydroscopic polyethylene or polypropylene fillers.
Type C	Comply with International Municipal Signal Association Specification no. 50-2. A minimum no. 20 copper drain wire must be connected to the equipment ground within the cabinet.

86-1.02F(2)(d)(iv) Reserved

86-1.02F(2)(d)(v) Signal Interconnect Cables

A signal interconnect cable must be a 6-pair type with stranded, tinned, copper no. 20 conductors. The insulation for each conductor must be color-coded polypropylene with a minimum 13-mils nominal thickness. The conductors must be in color-coded, twisted pairs. Each pair must be wrapped with an aluminum polyester shield and have a no. 22 or larger, stranded, tinned, copper drain wire inside the shielded pair.

The cable jacket must be black HDPE rated for a minimum of 300 V(ac) and 60 degrees C. The jacket must have a minimum nominal wall thickness of 40 mils.

86-1.02F(2)(e) Reserved

86-1.02G Equipment Identification Characters

Equipment identification characters must be 2-1/2 inch, series D lettering, except on wood poles, they must be 3-inch lettering.

The characters must be self-adhesive reflective labels or paint, except on wood poles, they must be embossed on aluminum.

86-1.02H Splicing Materials

Splicing materials include:

1. Connectors
2. Electrical insulating coating
3. PVC electrical tape
4. Butyl rubber stretchable tape
5. PVC pressure-sensitive adhesive tape
6. Heat shrink tubing

Connectors must be C-shaped compression or butt type.

Electrical insulating coating must be a fast drying sealant with low nontoxic fumes.

PVC electrical tape must have a minimum thickness of 80 mils.

Butyl rubber stretchable tape with liner must have a minimum thickness of 120 mils.

PVC pressure-sensitive adhesive electrical tape must have a minimum thickness of 6 mils.

Electrical tapes must be self-fusing, oil- and flame-resistant, synthetic rubber and be UL listed or NRTL certified.

Heat-shrink tubing must be made of irradiated polyolefin tubing with a minimum wall thickness of 40 mils before contraction and an adhesive mastic inner wall. When heated, the inner wall must melt and fill the crevices and interstices of the covered splice area and the outer wall must shrink to form a waterproof insulation.

Heat-shrink tubing must comply with the requirements for extruded, insulating tubing at 600 V(ac) specified in UL Standard 468D and ANSI C119.1 and the requirements shown in the following table:

Heat-Shrink Tubing Requirements

Quality characteristic	Requirement
Shrinkage ratio of supplied diameter[a] (max, %)	33
Dielectric strength (min, kV/in) Resistivity (min, Ω/in)	350 25×10^{13}
Tensile strength (min, psi)	2,000
Operating temperature (°C)	-40–90 (135 °C in emergency)
Water absorption (max, %)	0.5

[a]When heated to 125 °C and allowed to cool to 25 °C

86-1.02I Connectors and Terminals

A connector and terminal must comply with SAE-AS7928 and be a crimp type, rated for 600 V(ac) and either UL listed or NRTL certified.

86-1.02J Standards, Poles, Pedestals, and Posts

Standards for signals, lighting, and flashing beacons, poles for closed circuit television, pedestals for cabinets, posts for extinguishable message sign and posts for pedestrian push button assemblies must comply with section 56-3.

86-1.02K Luminaires

86-1.02K(1) General

Luminaire must be either LED or low-pressure-sodium type.

86-1.02K(2) LED Luminaires

LED luminaire must be on the Authorized Material List for LED luminaires and must:

1. Be self-contained, not requiring assembly.
2. Comply with UL 1598 for luminaires in wet locations.
3. Have a power supply with:
   3.1. ANSI/IEC rating of at least IP65.
   3.2. 2 leads to accept standard 0-10 V(dc).
   3.3. Dimming control compatible with IEC 60929, Annex E. If the control leads are open or the analog control signal is lost, the circuit must default to 100-percent power.
   3.4. Case temperature self rise of 77 degrees F or less above ambient temperature in free air with no additional heat sinks.
4. Weigh no more than 35 lb.
5. Have a minimum operating life of 63,000 hours when operated for an average time of 11.5 hours at an average temperature of 70 degrees F.
6. Be designed to operate over a temperature range from -40 to 130 degrees F.
7. Be operationally compatible with photoelectric controls.
8. Have a correlated color temperature range from 3,500 to 6,500 K and a color rendering index of 65 or greater.
9. Have a maximum-effective projected area of 1.4 sq ft when viewed from either side or end.
10. Have a housing color that matches a color no. 26152 to 26440, 36231 to 36375, or 36440 of FED-STD-595.
11. Have an ANSI C136.41-compliant, locking-type, photocontrol receptacle with dimming connections and a watertight shorting cap.
12. Comply with LM-79, LM-80 and California Test 611.

The individual LEDs must be connected such that a catastrophic loss or a failure of 1 LED does not result in the loss of more than 20 percent of the luminous output of the luminaire.

The luminaire must be permanently marked inside the unit and outside of its packaging box. Marking consists of:

1. Manufacturer's name or trademark

2. Month and year of manufacture
3. Model, serial, and lot numbers
4. Rated voltage, wattage, and power in VA

An LED luminaire's onboard circuitry must include a surge protection device to withstand high-repetition noise transients caused by utility line switching, nearby lightning strikes, and other interferences. The device must protect the luminaire from damage and failure due to transient voltages and currents as defined in Tables 1 and 4 of ANSI/IEEE C64.41.2 for location category C-High. The surge protection device must comply with UL 1449 and ANSI/IEEE C62.45 based on ANSI/IEEE C62.41.2 definitions for standard and optional waveforms for location category C-High.

An LED luminaire and its associated onboard circuitry must comply with the Class A emission limits under 47 CFR 15(B) for the emission of electronic noise.

The fluctuations of line voltage must have no visible effect on the luminous output.

The operating voltage may range from 120 to 480 V(ac), 60 ± 3 Hz. Luminaire must operate over the entire voltage range or the voltage range must be selected from one of the following:

1. Luminaire must operate over a voltage range from 95 to 277 V(ac). The operating voltages for this option are 120 V(ac) and 240 V(ac).
2. Luminaire must operate over a voltage range from 347 to 480 V(ac). The operating voltage for this option is 480 V(ac).

LED luminaire must have a power factor of 0.90 or greater. The total harmonic distortion, current, and voltage induced into a power line by a luminaire must not exceed 20 percent. The L70 of the luminaire must be the minimum operating life or greater. Illuminance measurements must be calibrated to standard photopic calibrations.

The maximum power consumption and maintained illuminance of the LED luminaires must comply with the isofootcandle curves as shown.

LED luminaire must not allow more than 10 percent of the rated lumens to project above 80 degrees from vertical and 2.5 percent of the rated lumens to project above 90 degrees from vertical.

Luminaire must have passive thermal management with enough capacity to ensure proper heat dissipation and functioning of the luminaire over its minimum operating life. The maximum junction temperature for the minimum operating life must not exceed 221 degrees F.

The junction-to-ambient thermal resistance must be 95 degrees F per watt or less. The use of fans or other mechanical devices is not allowed for cooling the luminaire. The heat sink must be made of aluminum or other material of equal or lower thermal resistance. The luminaire must contain circuitry that automatically reduces the power to the LEDs so the maximum junction temperature is not exceeded when the ambient temperature is 100 degrees F or greater.

The luminaire's housing must be fabricated from materials designed to withstand a 3,000-hour salt spray test under ASTM B117. All aluminum used in housings and brackets must be made of a marine-grade alloy with less than 0.2 percent copper. All exposed aluminum must be anodized. A chromate conversion undercoating must be used underneath a thermoplastic polyester powder coat.

The housing must be designed to prevent the buildup of water on its top surface. Exposed heat sink fins must be oriented to allow water to run off the luminaire and carry dust and other accumulated debris away from the unit. The optical assembly of the luminaire must be protected against dust and moisture intrusion to at least an UL 60529 rating of IP66. The power supply enclosure must be protected to at least an UL 60529 rating of IP43.

The housing must have a slip fitter capable of being mounted on a 2-inch-diameter pipe tenon. Slip fitter must:

1. Fit on mast arms with outside diameters from 1-5/8 to 2-3/8 inches
2. Be adjustable to a minimum of ±5 degrees from the axis of the tenon in a minimum of 5 steps: +5, +2.5, 0, -2.5, -5
3. Have clamping brackets that:

3.1. Are made of corrosion-resistant materials or treated to prevent galvanic reactions
3.2. Do not bottom out on the housing bosses when adjusted within the designed angular range
3.3. Do not permanently set in excess of 1/32 inch when tightened

Each refractor or lens must be made of UV-inhibiting high-impact plastic, such as acrylic or polycarbonate, or heat- and impact-resistant glass. The refractor or lens must be resistant to scratching. Polymeric materials, except for the lenses of enclosures containing either the power supply or electronic components of the luminaire, must be made of UL94 V-0 flame-retardant materials.

An LED luminaire and its internal components must be able to withstand mechanical shock and vibration.

If the components are mounted on a down-opening door, the door must be hinged and secured to the luminaire's housing separately from the refractor or flat lens frame. The door must be secured to the housing to prevent accidental opening. A safety cable must mechanically connect the door to the housing.

An LED luminaire must have a barrier-type terminal block secured to the housing to connect field wires. The terminal screws must be captive and equipped with wire grips for conductors up to no. 6.

The conductors and terminals must be identified and marked.

86-1.02K(3) Low-Pressure Sodium Luminaires

A low-pressure sodium luminaire must be an enclosed cutoff or semi-cutoff type and be self-contained, not requiring assembly.

The housing must be either (1) a minimum 1/16-inch-thick, corrosion-resistant, die-cast aluminum sheet and plate with concealed continuous welds or (2) a minimum 3/32-inch-thick, acrylonitrile-butadiene-styrene sheet material on a cast aluminum frame. The housing must provide mounting for all electrical components and a slip fitter. The housing must be divided into optical and power compartments that are individually accessible for service and maintenance.

The painted exterior surface of the luminaire must be finished with a fused coating of electrostatically applied polyester powder paint or other UV-inhibiting film. The color must be aluminum gray.

A sealing ring must be installed in the pipe tenon opening to prevent the entry of water and insects into the power and optical compartments. The ring must be made of high-temperature neoprene or equal material.

The power unit assembly must be accessible through a weather-tight, hinged cover secured to the housing with spring latches or captive screws.

The luminaire's hardware must be stainless steel or cadmium plated. Removable components must be secured with machine screws or bolts instead of sheet metal screws.

A semi-cutoff luminaire or a molded refractor-style cutoff luminaire must include a refractor. Other cutoff luminaires must include a flat lens. The refractor assembly and flat lens assembly must be designed to rigidly maintain their shape and be hinged and secured to the housing with spring latches.

The refractor must be either a 1-piece injection-molded polycarbonate with a minimum thickness of 3/32 inch or a 1-piece injection-molded acrylic with a minimum thickness of 1/8 inch. Alternate methods of manufacturing the refractor may be authorized provided minimum specified thicknesses are maintained.

The flat lens must be a 1-piece polycarbonate with a minimum thickness of 3/32 inch, mounted to a metal frame.

The lamp socket must be made of high-temperature, flame-retardant, thermoset material with self-wiping contacts or an equal. The socket must be rated for 660 W and 1,000 V(ac). The position of the socket and support must maintain the lamp in the correct relationship with the reflector and refractor for the designed light distribution pattern. The reflector may be an integral part of the housing.

The luminaire must comply with the isofootcandle curves as shown.

Low-pressure sodium lamp must:

1. Be a 180 W, single-ended, bayonet-base, tubular, gas-discharge lamp

2. Maintain a minimum of 93 percent of its initial lumens over its rated life
3. Reach 80 percent of its light output within 10 minutes
4. Restrike within 1 minute after a power outage or voltage drop at the lamp socket
5. Have ANSI L74/E designation

The lamp operating position must be at ±20 degrees from the horizontal.

Lamp must comply with the minimum performance requirements shown in the following table:

Minimum Performance Requirements

Quality characteristic	Requirement
Initial lumens (lm)	33,000
Rated average life at 10 h/start (h)	18,000

The low-pressure sodium lamp ballast must be an autotransformer or high-reactance type. The power factor must be not less than 90 percent when the ballast is operated at the nominal line voltage with a nominally-rated reference lamp. The lamp wattage regulation spread must not vary by more than ±6 percent for ±10 percent input voltage variation from nominal through life.

At the line voltage, the ballast must have a lamp current crest factor not exceeding 1.8 and ballast loss not exceeding 24 percent for a 180 W ballast.

The ballast must include a multi-circuit connector for quick disconnection.

86-1.02K(4) Reserved

86-1.02L Reserved

86-1.02M Photoelectric Controls

Photoelectric control types are as shown in the following table:

Photoelectric Control Types

Control type	Description
I	Pole-mounted photoelectric unit. Test switch housed in an enclosure.
II	Pole-mounted photoelectric unit. Contactor and test switch located in a service equipment enclosure.
III	Pole-mounted photoelectric unit. Contactor and a test switch housed in an enclosure.
IV	A photoelectric unit that plugs into a NEMA twist-lock receptacle, integral with the luminaire.
V	A photoelectric unit, contactor, and test switch located in a service equipment enclosure.

The pole-mounted adaptor for Type I, II, and III photoelectric controls must include a terminal block and cable supports or clamps to support the wires.

The enclosure for Type I and III photoelectric controls must be a NEMA 3R type. The enclosure must have a factory-applied, rust-resistant prime coat and finish coat. The enclosure must be hot-dip galvanized or painted to match the color of the lighting standard.

Photoelectric unit must:

1. Have a screen to prevent artificial light from causing cycling.
2. Have a rating of 60 Hz, 105-130 V(ac), 210-240 V(ac), or 105-240 V(ac).
3. Operate at a temperature range from -20 to 55 degrees C.
4. Consume less than 10 W.
5. Be a 3-prong, twist-lock type with a NEMA IP 65 rating, ANSI C136.10-compliant
6. Have a fail-on state
7. Fit into a NEMA-type receptacle
8. Turn on from 1 to 5 footcandles and turn off from 1.5 to 5 times the turn-on level. Measurements must be made by procedures in *EEI-NEMA Standards for Physical and Electrical Interchangeability of Light-Sensitive Control Devices Used in the Control of Roadway Lighting.*

Type I, II, III, and V photoelectric controls must have a test switch to allow manual operation of the lighting circuit. Switch must be:

1. Single-hole mounting, toggle type
2. Single pole and single throw
3. Labeled *Auto-Test* on a nameplate

Photoelectric control's contactor must be:

1. Normally open
2. Mechanical-armature type with contacts of fine silver, silver alloy, or equal or better material
3. Installed to provide a minimum space of 2-1/2 inches between the contactor terminals and the enclosure's sides

The terminal blocks must be rated at 25 A, 600 V(ac), molded from phenolic or nylon material, and be the barrier type with plated-brass screw terminals and integral marking strips.

86-1.02N Fused Splice Connectors

The fused splice connector for 240 and 480 V(ac) circuits must simultaneously disconnect both ungrounded conductors. The connector must not have exposed metal parts except for the head of the stainless steel assembly screw. The head of the assembly screw must be recessed a minimum of 1/32 inch below the top of the plastic boss that surrounds the head.

The connector must protect the fuse from water or weather damage. Contact between the fuse and fuse holder must be spring loaded.

Fuses must:

1. Be standard, midget, ferrule type
2. Have a nontime-delay feature
3. Be 3/32 by 1-1/2 inches

86-1.02O Grounding Electrodes

Grounding electrode must be:

1. 1 piece
2. Minimum 10-foot length of one of the following:
   2.1. Galvanized steel rod or pipe not less than 3/4 inch in diameter
   2.2. Copper clad steel rod not less than 5/8 inch in diameter

86-1.02P Enclosures

86-1.02P(1) General

The enclosures must be rated NEMA 3R and include a dead front panel and a hasp with a 7/16-inch-diameter hole for a padlock.

The enclosure's machine screws and bolts must not protrude outside the cabinet wall.

The fasteners on the exterior of an enclosure must be vandal resistant and not be removable. The exterior screws, nuts, bolts, and washers must be stainless steel.

86-1.02P(2) Service Equipment Enclosures

A service equipment enclosure must be factory wired and manufactured from steel and galvanized or have factory-applied, rust-resistant prime and finish coats, except Types II and III.

Type II and III service equipment enclosures must:

1. Be made of 0.125-inch minimum thickness 5052-H32 aluminum sheet complying with ASTM B209.
2. Be manufactured using gas metal arc welding with bare aluminum welding electrodes. The electrodes must comply with AWS A5.10 Class ER5356.

3. Be manufactured using welding procedures, welders, and welding operators that comply with the requirements for welding procedures, welders, and welding operators in in AWS B2.1, "Specification for Welding Procedure and Performance Qualification."
4. Have full-seal weld exterior seams.
5. Exterior welds must be ground smooth and edges filed to a radius of at least 0.03 inch.
6. Have a surface finish that complies with MIL-A-8625 for a Type II, Class I coating, except the anodic coating must have a minimum thickness of 0.0007 inch and a minimum coating weight of 0.001 oz/sq in.

If a Type III enclosure houses a transformer of more than 1 kVA, the enclosure must have effective screened ventilation louvers of no less than 50 sq. in for each louver. The framed screen must be stainless no. 304 with a no. 10 size mesh and secured with at least 4 bolts.

The dead front panel on a Type III service equipment enclosure must have a continuous stainless steel or aluminum piano hinge. The panel must be secured with a latch or captive screws. No live part must be mounted on the panel.

The enclosure must be watertight and marked as specified in NEC to warn of potential electric-arc flash hazards.

Internal conductors for the photoelectric control unit must be 600 V(ac), 14 AWG (THHN) stranded machine tool wire. Where subject to flexing, 19 stranded wire must be used.

The meter area must be have a sealable, lockable, weather-tight cover that can be removed without the use of tools.

For Type III-A, III-B, and III-C enclosures, the meter socket must be a 5-clip type, and the landing lug must be suitable for multiple conductors.

For a Type III-D enclosure, the meter socket must be a 7-clip type, and the landing lug must be suitable for multiple conductors. The pedestal must comply with the Electric Utility Service Equipment Requirements Committee drawing no. 308 or 309.

Landing lugs must be (1) sized for the incoming service utility conductors, (2) compatible with either copper or aluminum conductors, and (3) made of copper or tin-plated aluminum. Live parts of the electrical equipment must be guarded against accidental contact.

The main and neutral busses of the enclosure must be made of tin-plated copper, be rated for 125 A, and be suitable for copper or aluminum conductors.

Each service equipment enclosure must have up to 2 main circuit breakers that will simultaneously disconnect ungrounded service-entrance conductors.

Circuit breaker for a service equipment enclosure must:

1. Be quick-break on either automatic or manual operation
2. Be trip indicating
3. Be internal-trip type
4. Be UL listed or NRTL certified and comply with UL 489 or equal
5. Be clearly marked with the frame size
6. Have an operating mechanism that is enclosed and trip-free from the operating handle on overload
7. Have the trip rating clearly marked on the operating handle
8. Have an interior made of copper

Circuit breakers used as disconnects must have a minimum interrupting capacity of 10,000 A, rms.

The interior of the enclosure must accept plug-in circuit breakers. A minimum of 6 standard single-pole circuit breakers, 3/4" nominal, must be provided for branch circuits.

Identify each circuit breaker and component by description using an engraved phenolic nameplate attached with stainless steel rivets or screws.

Nameplate must be installed:

1. Adjacent to the breaker on the dead front panel. The characters must be a minimum of 1/8 inch high.
2. Adjacent to the component on the back panel. The characters must be a minimum of 1/8 inch high.
3. At the top exterior of the door panel. The nameplate must include the system number, voltage, and number of phases engraved in minimum 3/16-inch-high characters.

A plastic-laminated wiring diagram must be attached inside the enclosure with brass eyelets by a UL-listed or NRTL-certified method.

86-1.02P(3) Lighting and Sign Illumination Enclosures

A lighting and sign illumination enclosure must be manufactured from steel and either galvanized, cadmium plated, or powder coated.

86-1.02Q Cabinets

86-1.02Q(1) General

Cabinets must be factory wired except for battery backup system cabinets.

The fasteners on the exterior of a cabinet, except for battery backup system cabinets, must be removable and vandal resistant. The exterior screws, nuts, bolts, and washers must be stainless steel.

Terminal blocks, circuit breakers, and a power supply must be UL approved.

86-1.02Q(2) Department-Furnished Controller Cabinets

A Department-furnished controller assembly consists of a Model 170E or 2070E controller unit, a wired controller cabinet, and all auxiliary equipment required to operate the system. The Department does not furnish anchor bolts.

86-1.02Q(3) Controller Cabinets

The controller cabinet must be a Model 334L, comply with TEES, and be on the Authorized Material List for traffic signal control equipment. The cabinet must have 3 drawer shelves. Each shelf must be attached to the tops of 2 supporting angles with 4 screws.

86-1.02Q(4) Telephone Demarcation Cabinets

86-1.02Q(4)(a) General

The doors of a telephone demarcation cabinet must be attached using continuous stainless steel piano hinges.

86-1.02Q(4)(b) Type A Telephone Demarcation Cabinets

Reserved

86-1.02Q(4)(c) Type B Telephone Demarcation Cabinets

A Type B telephone demarcation cabinet consists of a mounting panel, outlets, circuit breaker, fan, dead front plates, and fuse.

The mounting panel must be made of 3/4-inch-thick ACX-grade plywood.

The mounting panel must be fastened to the cabinet with nuts, lock washers, and flat washers to 10 welded studs.

The cabinet must be made of 0.125-inch-thick anodized aluminum.

The cabinet door must be hung and secured with drawn latches, lockable with a padlock. The padlock latches must each have a minimum 7/16-inch-diameter hole.

Ventilation louvers must be located on the door.

The fan must be located in a ventilator housing and be controlled thermostatically. The thermostat control must have a range from 80 to 130 degrees F.

The thermostat and fan circuit must be protected with a fuse rated for 175 percent of the motor capacity. The fan capacity must be a minimum 25 cfm.

86-1.02Q(4)(d) Type C Telephone Demarcation Cabinets

Reserved

86-1.02Q(5) Battery Backup System Cabinets

The cabinet for a battery backup system must comply with TEES and be on the Authorized Material List for traffic signal control equipment.

86-1.02R Signal Heads

86-1.02R(1) General

A signal head consists of a signal mounting assembly, backplate, and signal face.

The head must have a terminal block attached to the back of one housing. The terminal block must have enough positions to accommodate all indications. Each position must be permanently labeled for the indications used.

The metal signal heads must not fracture or deflect more than half the lens diameter when tested under California Test 666.

The plastic signal heads must not fracture or deflect when tested under California Test 605.

The deflection must not be more than 10 degrees in either the vertical or horizontal plane after the wind load has been removed from the front of the signal face or more than 6 degrees in either the vertical or horizontal plane after the wind load has been removed from the back of the signal face.

86-1.02R(2) Signal Mounting Assemblies

Signal mounting assembly must include:

1. 1-1/2-inch-diameter steel pipe or galvanized conduit
2. Pipe fitting made of ductile iron, galvanized steel, bronze, or aluminum alloy, Type AC-84B, no. 380
3. Mast arm and post-top slip fitters and terminal compartments made of cast bronze or hot-dip galvanized ductile iron

The horizontal distance between the vertical centerlines of the terminal compartment or slip fitter and of each signal face must not exceed 11 inches except where required for proper signal face alignment or to allow programming of programmed visibility signal sections.

The mounting assembly must be watertight and free of sharp edges or protrusions that might damage conductor insulation. The assembly must have positive-locking serrated fittings that prevent signal faces from rotating when the fittings are mated with similar fittings on the faces.

Each terminal compartment must be fitted with a terminal block having a minimum of 12 positions, each with 2 screw-type terminals. Each terminal must accommodate at least five no. 14 conductors. The terminal compartment must have a cover for easy access to the terminal block.

86-1.02R(3) Backplates

The backplate material must be a homogeneous black color with a lusterless finish.

A metal backplate must be made of a minimum 1/16-inch-thick 3001-14 aluminum.

A plastic backplate must have a minimum thickness of 1/16 inch and be formed from sheet plastic or assembled from extruded, molded, or cast plastic sections. Sections must be factory joined using one of the following:

1. Appropriate solvent cement.
2. Aluminum rivets and washers painted or permanently colored to match the backplate.
3. No. 10 machine screws with flat washers, lock washers, and nuts painted to match the backplate.

Each plastic backplate must be secured to the plastic signal face such that it resists removal or permanent deformation.

86-1.02R(4) Signal Faces

Signal face consists of signal sections with signal housings, LED modules, and visors.

Signal face must:

1. Be adjustable and allow for 360-degree rotation about the vertical axis
2. Comply with ITE publications ST-052-E, *Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement* and ST-054, *Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement*
3. Be sealed with a neoprene gasket at the top opening

A metal signal face must have a metal backplate and visor.

A plastic signal face must have a plastic backplate and visor.

If a signal face is supported by a Type MAS slip fitter, spacers are required between the 2 sections. The spacers must be made of the same material as the housing. The vertical dimension of the spacers must allow proper seating of the serrations between the slip fitter and the 2 sections. The 2 sections must be joined with at least two no. 10 minimum machine screws through holes near the front of the housing and the spacers and matching holes in a reinforcing plate installed in the housing.

86-1.02R(4)(a) Signal Sections

86-1.02R(4)(a)(i) General

Signal section must have:

1 Opening at the top and bottom for a 1-1/2-inch pipe
2. Maximum height of 10-1/4 inches for an 8-inch section and 14-3/4 inches for a 12-inch section
3. Hinge pins, door-latching devices, and other exposed hardware manufactured of Type 304/304L or 305 stainless steel
4. Interior screws and fittings manufactured of stainless steel or steel with a corrosion-resistant plating or coating
5. Gaskets made of a material that is not degraded if installed in a section with metal or plastic housing

Sections must be capable of being joined together to form a signal face in any combination. This interchangeability is not required between metal and plastic sections.

Each section must be joined to an adjacent section by one of the following:

1. Minimum of 3 machine screws for 8-inch sections and 4 machine screws for 12-inch sections, installed through holes near the front and back of the housing. Each screw must be a no. 10 and have a nut, flat washer, and lock washer.
2. 2 machine screws, each with a nut, flat washer, and lock washer, installed through holes near the front of the housing and a fastener through the 1-1/2-inch pipe opening. The fastener must have 2 large, flat washers to distribute the load around the pipe's opening and 3 carriage bolts, each with a nut and lock washer. The minimum screw size must be no. 10, and the carriage bolt size must be 1/4 inch.

The holes for the machine screws must be either cast or drilled during signal section fabrication. Each hole must be surrounded by a minimum 1/8-inch-wide boss to allow contact between signal sections about the axis of the hole.

A serrated nylon washer must be inserted between each plastic signal section and the metal mounting assembly. Each serrated nylon washer must be from 3/16 to 1/4 inch thick. The serrations must match those on the signal section and the mounting assembly.

86-1.02R(4)(a)(ii) Programmed Visibility Signal Sections

Programmed visibility signal section must have:

1. Nominal 12-inch-diameter circular or arrow indication
2. Cap visor
3. Adjustable connection that:
   3.1. Provides incremental tilting from 0 to 10 degrees above or below the horizontal
   3.2. Maintains a common vertical axis through couplers and mountings

The terminal connection must allow external adjustment about the mounting axis in 5-degree increments.

The visibility of each signal section must be capable of adjustment or programming within the section.

The adjustment for the section must be preset at 4 degrees below the horizontal.

86-1.02R(4)(a)(iii) Signal Housings

The signal housing must:

1. Be die-cast aluminum, permanent mold-cast aluminum, or if specified, structural plastic
2. Comply with ITE publications ST-052-E, *Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement* and ST-054, *Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement* if made of die-cast or permanent mold-cast aluminum
3. Have a 1-piece, hinged, square-shaped door that is:
   3.1. Designed to allow access for replacement of modules without the use of tools
   3.2. Secured such that it remains closed during loading tests
4. Have a watertight module or lens mounted in the door
5. Have a terminal block attached to the back, with the terminals permanently labeled for conductors to facilitate field wiring

Each housing must have reinforcement plates. Reinforcement plates must be either sheet aluminum, galvanized steel, or cast aluminum. Each plate must have a minimum thickness of 0.11 inch and a hole concentric with a 1-1/2-inch pipe-mounting hole in the housing. Reinforcement plates must be placed as specified in the following table:

Reinforcement Plate Placement

Material	Placement
Sheet aluminum	Inside and outside of housing
Galvanized steel	Inside of housing
Cast aluminum	Outside of housing

Reinforcement plates placed outside of the housing must be finished to match the signal housing color and be designed to allow a proper serrated coupling between the signal face and the mounting hardware. A minimum of three no. 10 machine screws must be installed through holes in each plate and matching holes in the housing. Each screw must have a round or binder head, a nut, and a lock washer.

A metal housing must have a metal visor.

Plastic housing must:

1. Be molded in a single piece or fabricated from 2 or more pieces joined into a single piece
2. Be a black color throughout, including the door, matching color no. 17038, 27038, or 37038 of FED-STD-595
3. Have UV stability
4. Be self-extinguishing

If reinforcing webs are used to connect the back of the housing to the top, bottom, and sides of the adjacent housing, reinforcement plates are not required.

The exterior of the housing must be painted as specified in sections 78-4.08 and 59.

86-1.02R(4)(b) LED Signal Modules

An LED signal module must be on the Authorized Material List for LED traffic signal modules.

An LED signal module must comply with ITE publications ST-052-E, *Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement* and ST-054, *Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement*, except:

1. Maximum module weight must be 4 lb
2. Module must be a sealed unit with:

2.1. 2 color-coded conductors for the power connection except lane control modules must use 3 color-coded conductors
2.2. Printed circuit board that complies with TEES, chapter 1, section 6
2.3. Lens that is:
2.3.1. Convex or flat with a smooth outer surface
2.3.2. Made of UV-stabilized plastic or glass
2.4. 1-piece EPDM gasket
3. Module must include 3-foot-long conductors with attached quick-disconnect terminals
4. Identification must include:
4.1. Month and year of manufacture
4.2. 1-inch-diameter symbol of the module type with the module color written adjacent to the symbol in 0.50-inch-high letters
5 LED must be the ultra-bright type rated for 100,000 hours of continuous operation
6. Module must have an integral power supply

Individual LEDs must be wired such that a loss or failure of 1 LED will not result in a loss of more than 5 percent of the module's light output. Failure of an individual LED in a string must not result in a loss of an entire string or other indication.

The symbol for a 12-inch U-turn section must be a 15/16-inch-wide inverted *U* with an arrow on the left end.

A lane control section must be a combination module with a red *X* and green arrow. The conductor function and color code must be as shown in the following table:

Conductor Function and Color Code

Function	Color
Neutral	White
Red *X*	Red
Green arrow	Brown

The minimum power consumption for an LED signal module must be 5 W.

The maximum power consumption for an LED signal module must be as shown in the following table:

Maximum Power Consumption

LED signal module type	Power consumption (W)					
	Red		Yellow		Green	
	25 °C	74 °C	25 °C	74 °C	25 °C	74 °C
8-inch circular	8	13	13	16	12	12
12-inch circular	11	17	22	25	15	15
12-inch arrow	9	12	10	12	11	11
12-inch U-turn	9	12	10	12	11	11
Bicycle	11	17	22	25	15	15
Programmed visibility	11	17	22	25	15	15
Lane control (*X*)	9	12	--	--	--	--
Lane control (*Arrow*)	--	--	--	--	11	11

Red and green LED signal modules operating over a temperature range from -40 to 74 degrees C and yellow LED signal modules operating at 25 degrees C must maintain the minimum illumination values for 48 months as shown in the following tables:

Minimum Maintained Intensities for Circular Indications

Angle (v,h)	Intensities (cd)					
	8-inch			12-inch		
	Red	Yellow	Green	Red	Yellow	Green
2.5, ±2.5	133	267	267	339	678	678
2.5, ±7.5	97	194	194	251	501	501
2.5, ±12.5	57	113	113	141	283	283
2.5, ±17.5	25	48	48	77	154	154
7.5, ±2.5	101	202	202	226	452	452
7.5, ±7.5	89	178	178	202	404	404
7.5, ±12.5	65	129	129	145	291	291
7.5, ±17.5	41	81	81	89	178	178
7.5, ±22.5	18	37	37	38	77	77
7.5, ±27.5	10	20	20	16	32	32
12.5, ±2.5	37	73	73	50	101	101
12.5, ±7.5	32	65	65	48	97	97
12.5, ±12.5	28	57	57	44	89	89
12.5, ±17.5	20	41	41	34	69	69
12.5, ±22.5	12	25	25	22	44	44
12.5, ±27.5	9	16	16	16	32	32
17.5, ±2.5	16	32	32	22	44	44
17.5, ±7.5	14	28	28	22	44	44
17.5, ±12.5	10	20	20	22	44	44
17.5, ±17.5	9	16	16	22	44	44
17.5, ±22.5	6	12	12	20	41	41
17.5, ±27.5	4	9	9	16	32	32

Minimum Maintained Luminance for Indications

Indication type	Luminance (fL)		
	Red	Yellow	Green
Arrow	1,610	3,210	3,210
U-turn	1,610	3,210	3,210
Bicycle	1,610	1,610	1,610
Lane control (*X*)	1,610	--	--
Lane control (*Arrow*)	--	--	1,610

Minimum Maintained Luminance for Programmed Visibility Indications

Indication type	Luminance (cd)		
	Red	Yellow	Green
PV at angle v=2.5, h=±2.5	314	314	314

Conductors must be prewired to the terminal block.

86-1.02R(4)(c) Visors and Directional Louvers

The visor must be a tunnel type.

The visor must have a downward tilt from 3 to 7 degrees with a minimum length of 9-1/2 inches for nominal 12-inch round lenses and 7 inches for nominal 8-inch round lenses.

A metal visor must be formed from minimum 0.050-inch-thick aluminum alloy sheet.

A plastic visor must be either formed from sheet plastic or blow-molded. The plastic must be a black homogeneous color with a lusterless finish. A visor must withstand a wind load applied to its side for 24

hours without permanent deformation or removal from its door when tested under California Test 605 for plastic visors and California Test 666 for metal visors.

If directional louvers are used, the louvers must fit into full-circular signal visors. Louvers must consist of one of the following:

1. Outside cylinder constructed of sheet steel with a minimum nominal thickness of 0.030 inch and vanes constructed of sheet steel with a minimum nominal thickness of 0.016 inch.
2. Outside cylinder and vanes constructed of 5052-H32 aluminum alloy of equal thickness.

86-1.02S Pedestrian Signal Heads

86-1.02S(1) General

A pedestrian signal head consists of a pedestrian signal mounting assembly and a pedestrian signal face comprising of a pedestrian signal housing, an LED countdown pedestrian signal face module, and a front screen.

86-1.02S(2) Pedestrian Signal Mounting Assemblies

A pedestrian signal mounting assembly must comply with the specifications for a signal mounting assembly in section 86-1.02R, except mast arm slip fitters are not required.

86-1.02S(3) Pedestrian Signal Faces

86-1.02S(3)(a) General

Each pedestrian signal face must include a light-duty terminal block rated at 5 A and have 12 positions with no. 6-by-1/8-inch binder head screws. Each position must have 1 screw-type terminal.

The wiring and terminal block must comply with ITE publication ST-055-E*, Pedestrian Traffic Control Signal Indicators: Light Emitting Diode (LED) Signal Modules*.

86-1.02S(3)(b) Pedestrian Signal Housings

Pedestrian signal housing must comply with the specifications for a signal housing in 86-1.02R(4)(a)(iii), except the maximum overall dimensions must be 18-1/2 inches wide, 19 inches high, and 11-1/2 inches deep and without:

1. Visor
2. Watertight module or lens mounted in the door
3. Reinforcement plates

The housing must have a terminal block attached to the back. The terminal block must have enough positions to accommodate all indications. Each position must be permanently labeled for the indications used.

86-1.02S(3)(c) LED Countdown Pedestrian Signal Face Modules

An LED countdown PSF module must comply with ITE publication ST-055-E*, Pedestrian Traffic Control Signal Indicators: Light Emitting Diode (LED) Signal Modules*, except the material must comply with ASTM D3935 and the module must have:

1. Ultra-bright-type LED rated for 100,000 hours of continuous operation.
2. Lot number and month and year of manufacture permanently marked on the back of the module
3. Prominent and permanent vertical markings for accurate indexing and orientation within the pedestrian signal housing if a specific mounting orientation is required. Markings must be a minimum of 1 inch in height and include an up arrow and the word *up* or *top.*
4. Circuit board complying with TEES, chapter 1, section 6.

Individual LEDs must be wired such that a loss or failure of 1 LED will not result in a loss of more than 5 percent of the module's light output. Failure of an individual LED in a string must not result in a loss of an entire string or other indication.

Each symbol must be at least 9 inches high and 5-1/4 inches wide. The 2-digit countdown timer, *Upraised Hand*, and *Walking Person* indications must be electronically isolated from each other. The 3 indications must not share a power supply or interconnect circuitry.

The module must operate over the specified ambient temperature and voltage range and be readable both day and night at distances up to the full width of the area to be crossed. Upon initial testing at 25 degrees C, the module must have at least the luminance values shown in the following table:

Luminance Values

PSF module symbol	Luminance
Upraised hand and 2-digit countdown timer (fL)	1,094
Walking person (fL)	1,547

The module must not exceed the power consumption requirements shown in the following table:

Maximum Power Consumption Requirements

PSF module display	At 24 ºC	At 74 ºC
Upraised Hand	10.0 W	12.0 W
Walking Person	9.0 W	12.0 W
2-digit countdown timer	6.0 W	8.0 W

86-1.02S(3)(d) Front Screen

Pedestrian signal face must have a front screen that is one of the following types:

1. 3/8-inch-thick aluminum honeycomb screen with 0.2-inch-wide cells or a 1/2-inch-thick plastic screen with 3/8-inch-wide squares with 1/16-inch wall thickness that:
   1.1. Is installed so it tilts downward at an angle of 15 ± 2 degrees from the top and completely covers the message plate.
   1.2. Includes a clear front cover made of either a minimum 1/8-inch-thick acrylic plastic sheet or a minimum 1/16-inch-thick polycarbonate plastic.
   1.3. Is held firmly in place, including the cover, with stainless steel or aluminum clips or stainless steel metal screws.
2. Polycarbonate screen that:
   2.1. Has a nominal thickness of 1/32 inch.
   2.2. Is a 1-1/2-inch-deep eggcrate or Z-crate type.
   2.3. Is mounted in a frame constructed of aluminum alloy or polycarbonate with a minimum thickness of 0.040 inch.
   2.4. Is held in place with stainless steel screws.

The screen and frame of a pedestrian signal face must be made of either (1) plastic that is a flat black color or (2) anodized aluminum that is a flat black color or finished with lusterless, black, exterior-grade latex paint formulated for application to metal surfaces.

86-1.02T Accessible Pedestrian Signals

Accessible pedestrian signal must comply with the *California MUTCD*, chapter 4E, and have:

1. Audible speech message that plays when the push button is actuated. The message must include the name of the street to be crossed. The accessible pedestrian signal must have at least 5 audible message options.
2. Push button locator tone that clicks or beeps.
3. Feature that activates the pedestrian phase during a failure of the audible message, locator tone, or vibrotactile device.

An accessible pedestrian signal must function with the Department-furnished Model 170E/2070E controller assembly.

No part of the accessible pedestrian signal must be installed inside the controller cabinet.
Power for the accessible pedestrian signal must be from the pedestrian signal housing terminal block.

The housing for the signal assembly must be made of corrosion-resistant material. Theft-proof bolts used for mounting the housing to the standard must be stainless steel with a content of 17 percent chromium and 8 percent nickel. The housing must be shaped to fit the pole's curvature.

The color of a metallic housing must match color no. 33538 of FED-STD-595.

The color of a plastic housing must match color no. 17038, 27038, or 37038 of FED-STD-595.

Accessible pedestrian signal must:

1. Have electronic switches, a potentiometer, or an access port for a device for controlling and programming the volume level and messaging
2. Be weatherproof and shockproof

Enclosure for the accessible pedestrian signal must:

1. Weigh less than 7 lb
2. Measure less than 16 by 6 by 5 inches
3. Have a wiring hole with a diameter not exceeding 1-1/8 inches
5. Have a switch for a push button
6. Have a vibrotactile device on the push button or on the arrow
7. Have an internal weatherproof speaker and microphone that senses the ambient sound level

The separation between adjacent holes used for conductors and mounting must be at least twice the diameter of the larger hole.

The speaker grills must be located on the surface of the enclosure. The speakers must not interfere with the housing or its mounting hardware.

The conductor cable between the accessible pedestrian signal assembly and the pedestrian signal head must be a 9 no. 20 conductor cable complying with MIL-W-16878D.

86-1.02U Push Button Assemblies

The housing for a push button assembly must be made of die-cast aluminum, permanent mold-cast aluminum, or UV-stabilized self-extinguishing structural plastic. The plastic housing must have a color throughout that matches color no. 17038, 27038, or 37038 of FED-STD-595.

If the push button is to be attached to a pole, the housing must be shaped to fit the pole's curvature.

The assembly must be waterproof and shockproof.

The push button's switch must be a single-pole, double-throw switching unit with screw-type terminals rated 15 A at 125 V(ac).

Switch for the push button must have:

1. Plunger actuator and a U frame to allow recessed mounting in the push button housing
2. Operating force of 3.5 lb
3. Maximum pretravel of 5/64 inch
4. Minimum overtravel of 1/32 inch
5. Differential travel from 0.002 to 0.04 inch
6. Minimum 2-inch diameter actuator

86-1.02V Reserved

86-1.02W Loop Detector Sealants

86-1.02W(1) General

Sealant for filling loop detector slots must be one of the following:

1. Asphaltic emulsion
2. Elastomeric sealant
3. Epoxy sealant for inductive loops
4. Hot-melt rubberized asphalt

86-1.02W(2) Asphaltic Emulsion Sealant

Asphaltic emulsion sealant must comply with the State Specification 8040-41A-15.

86-1.02W(3) Elastomeric Sealant

Elastomeric sealant must be a polyurethane material that cures only in the presence of moisture if used within the stated shelf life. The sealant must be suitable for use in both asphalt concrete and concrete pavement.

The cured elastomeric sealant must comply with the requirements shown in the following table:

Cured Elastomeric Sealant Requirements

Quality characteristic	Test method	Requirement
Hardness	ASTM D2240[a]	65–85
Tensile strength (min, MPa)	ASTM D412[b]	3.45
Elongation (min, %)		400
Flex at -40 °C[c]	--	No cracks
Weathering resistance	ASTM D822[d]	Slight chalking
Salt spray resistance:	ASTM B117[e]	
Tensile strength (min, MPa)		3.45
Elongation (min, %)		400
Dielectric constant (%)	ASTM D150[f]	<25

[a]Indentation at 25 °C and 50% relative humidity (Rex. Type A, Model 1700 only)
[b]Die C pulled at 508 mm/minute
[c]0.6-mm free film bend (180°) over 13-mm mandrel
[d]Weatherometer 350 h, cured 7 days at 25 °C and 50% relative humidity
[e]28 days at 38 °C with 5% NaCl, Die C, and pulled at 508 mm/minute)
[f]Change over a temperature range from -30 to 50 °C

86-1.02W(4) Hot-Melt Rubberized Asphalt Sealant

Hot-melt rubberized asphalt sealant must:

1. Be in solid form at room temperature and fluid at an application temperature range from 190 to 205 degrees C
2. Not produce toxic fumes
3. Be suitable for use in both asphalt concrete and concrete pavement
4. Be packaged in containers clearly marked *Detector Loop Sealant* with the manufacturer's batch and lot number.

The cured hot-melt rubberized asphalt sealant must comply with the requirements shown in the following table:

Cured Hot-Melt Rubberized Asphalt Sealant Requirements

Quality characteristic	Test method	Requirement
Cone penetration (max, 1/10 mm)	ASTM D5329, sec. 6[a]	35
Flow (max, mm)	ASTM D5329, sec. 8[b]	5
Resilience (min, %)	ASTM D5329, sec. 12[c]	25
Softening point (min, °C)	ASTM D36	82
Ductility (min, cm)	ASTM D113[d]	30
Flash point, Cleveland Open Cup (min, °C)	ASTM D92	288
Viscosity (Pa·s)	ASTM D4402[e]	2.5–3.5

[a]At 25 °C, 150 g, 5 s
[b]At 60 °C
[c]At 25 °C
[d]At 25 °C, 5 cm/minute
[e]Brookfield Thermosel, no. 27 spindle, 20 rpm, 190 °C

86-1.02X Reserved

86-1.02Y Transformers

A transformer must be single-phase and may be a nonsubmersible or submersible type.

A transformer must be a dry type designed for operation on a 60 Hz supply. The transformer must have a decal showing a connection diagram. The diagram must show either color coding or wire tagging with primary (H1, H2) or secondary (X1, X2) markers and the primary and secondary voltage and volt-ampere rating. A transformer must comply with the electrical requirements shown in the following table:

Transformer Electrical Requirements

Quality characteristic	Requirement
Rating (V(ac))	120/480, 120/240, 240/480, or 480/120
Efficiency (%)	> 95
Secondary voltage regulation and tolerance from half load to full load (%)	±3

Secondary 240 and 480 V(ac) windings must be center tapped.

The transformer must withstand the application of 2,200 V(ac) from core to coils and from coil to coil for a 1-minute period when tested immediately after operation of the transformer at full load for 24 hours.

The external leads for the secondary connections must be no. 10 Type USE rated for 600 V(ac).

The transformer's leads must extend a minimum of 12 inches from the case.

The transformer's insulation must be NEMA 185 C or better.

Each transformer must:

1. Include metal half-shell coil protection.
2. Have moisture-resistant, synthetic-varnish-impregnated windings.
3. Be waterproof and suitable for outdoor operation.

Each submersible transformer must:

1. Include a handle and a hanger.
2. Be securely encased in a rugged, corrosion-resistant, watertight case.
3. Have leads that extend out through 1 or more sealed hubs.
4. Be manufactured to withstand a 5-day test with 12-hour on and off periods submerged in 2 feet of salt water that is 2 percent salt by weight. The operating periods must be at full load.

86-1.02Z Batteries

Battery must:

1. Be deep-cycle, sealed, prismatic, lead-calcium-based, absorbed-glass-mat, valve-regulated, lead-acid type
2. Be rated for 12 V
3. Be rated for a temperature range from -25 to 60 degrees C
4. Be group size 24
5. Be commercially available and stocked locally
6. Be marked with a date code, maximum recharge data, and recharge cycles
7. Be new and fully charged when furnished
8. Be free from damage or deformities
9. Have a carrying handle
10. Have 2 top-mounted, threaded-stud posts that include all washers and nuts
11. Include insulating rubber covers for protecting the lugs, posts, and wiring: red for the positive terminal and black for the negative terminal

If a battery is used for a battery backup system, it must accommodate 3/8-inch ring lugs of a Department-furnished battery harness.

86-1.03 CONSTRUCTION

Not Used

86-1.04 PAYMENT

Not Used

Replace section 87 with:

04-15-16

87 ELECTRICAL SYSTEMS

04-15-16

87-1 GENERAL

87-1.01 GENERAL

87-1.01A Summary

Section 87 includes general specifications for constructing and installing electrical systems.

The Department deducts the cost for maintenance performed by the Department on new or portions of existing systems modified under the Contract.

87-1.01B Definitions

Reserved

87-1.01C Submittals

Reserved

87-1.01D Quality Assurance

87-1.01D(1) General

Reserved

87-1.01D(2) Quality Control

Before shipping the material to the job site, submit to METS test samples of:

1. Accessible pedestrian signals
2. LED countdown pedestrian signal face modules
3. LED signal modules
4. LED luminaires

Submit a sample size as shown in the following table:

Electrical Material Sampling

Contract quantity	Test sample size
1–8	1
9–15	2
16–25	3
26–90	5
91–150	8
151–280	13
281–500	20
501–1200	32

Before starting operation of an electrical system, perform a conductor test in the presence of the Engineer.

Conductor test consists of testing each conductor and the conductors in cables for:

1. Continuity.
2. Grounds.
3. Insulation resistance at 500 V(dc) between the circuit and ground. The insulation resistance must be a minimum of 10 MΩ on circuits, except it must be a minimum of 100 MΩ for inductive loop detector circuits.

Start the operational test of the system on any day except Friday or the day before a holiday. The operational test for signals must start from 9:00 a.m. to 2:00 p.m. Notify the Engineer 48 hours before starting the test.

An operational test consists of a minimum of 5 business days of continuous, satisfactory operation of the system. If the system fails, correct the problem and retest the system. A shutdown of the system caused by traffic, a power interruption, or unsatisfactory performance of Department-furnished materials does not constitute discontinuity of the test.

87-1.02 MATERIALS

Not Used

87-1.03 CONSTRUCTION

87-1.03A General

The Engineer determines the final locations of electrical systems.

Verify the locations of electrical systems and the depths of existing detectors, conduits, and pull boxes.

Notify the Engineer before performing work on the existing system.

You may shut down the system for alteration or removal.

Where an existing Department underground facility is shown within 10 feet of any excavation, locate and field mark the facility before performing work that could damage or interfere with the existing facility.

If an existing facility is within 2 feet of an excavation, determine the exact location of the facility by excavating with hand tools before using any power-operated or power-driven excavating or boring equipment. A vacuum excavator may be used if authorized.

Notify the Engineer immediately if an existing facility is damaged by your activities.

If existing underground conduit is to be incorporated into a new system, clean it with a mandrel or cylindrical wire brush and blow it clean with compressed air.

Limit the shutdown of traffic signal systems to normal working hours. Notify the local traffic enforcement agency before shutting down the signal.

Place temporary W3-1 and R1-1 signs in each direction to direct traffic through the intersection during shutdown of the signal. Place two R1-1 signs for 2-lane approaches. The signs must comply with part 2 of the *California MUTCD*.

Cover signal faces when the system is shut down overnight. Cover temporary W3-1 and R1-1 signs when the system is turned on.

If you work on an existing lighting system and the roadway is to remain open to traffic, ensure the system is in operation by nightfall.

Replace detectors you damage within 72 hours, or the Department replaces them and deducts the cost.

Work performed on an existing system not described is change order work.

Do not use electrical power from existing highway facilities unless authorized.

Maintain a minimum 48-inch clearance for a pedestrian pathway when placing equipment.

Except for service installation or work on service equipment enclosures, do not work above ground until all materials are on hand to complete the electrical work at each location.

Bond all metal components to form a continuous grounded system as specified in NEC.

Ground metallic equipment mounted less than 8 feet above the ground surface on a wood pole.

If you damage any portion of a concrete curb, sidewalk, curb ramp, driveway, or gutter depression, replace the entire section between contraction or expansion joints under section 73.

Apply equipment identification characters.

Orient louvers, visors, and signal faces such that they are clearly visible to approaching traffic from the direction being controlled.

Test loops and the detector lead-in cable circuit for continuity, ground, and insulation resistance at the controller cabinet before connecting detector lead-in cable to the terminal block.

Perform an operational test of the systems.

Before starting the operational test for systems that impact traffic, the system must be ready for operation, and all signs, pavement delineation, and pavement markings must be in place at that location.

87-1.03B Conduit Installation

87-1.03B(1) General

The installation of conduit includes installing caps, bushings, and pull tape and terminating the conduit in pull boxes, foundations, poles, or a structure.

Limit the number of bends in a conduit run to no more than 360 degrees between pull points.

Use conduit to enclose conductors except where they are installed overhead or inside standards or posts.

You may use a larger size conduit than specified for the entire length between termination points. Do not use a reducing coupling.

Extend an existing conduit using the same material. Terminate conduits of different materials in a pull box.

Install 2 conduits between a controller cabinet and the adjacent pull box.

Use a minimum trade size of conduit of:

1. 1-1/2 inches from an electrolier to the adjacent pull box
2. 1 inch from a pedestrian push button post to the adjacent pull box
3. 2 inches from a signal standard to the adjacent pull box
4. 3 inches from a controller cabinet to the adjacent pull box
5. 2 inches from an overhead sign to the adjacent pull box
6. 2 inches from a service equipment enclosure to the adjacent pull box
7. 1-1/2 inches if unspecified

Use Type 1 conduit:

1. On all exposed surfaces
2. In concrete structures
3. Between a structure and the nearest pull box

Ream the ends of shop-cut and field-cut conduit to remove burrs and rough edges. Make the cuts square and true. Do not use slip joints and running threads to couple conduit. If a standard coupling cannot be used for metal-type conduit, use a threaded union coupling. Tighten the couplings for metal conduit to maintain a good electrical connection.

Cap the ends of conduit to prevent debris from entering before installing the conductors or cables. Use a plastic cap for Type 1, 2, and 5 conduits and a standard pipe cap for all other types of conduit.

For Type 1, 2, and 5 conduits, use threaded bushings and bond them using a jumper. For other types of conduit, use nonmetallic bushings.

Do not install new conduit through foundations.

Cut Type 2 conduit with pipe cutters; do not use hacksaws. Use standard conduit-threading dies for threading conduit. Tighten conduit into couplings or fittings using strap wrenches or approved groove joint pliers.

Cut Type 3 conduit with tools that do not deform the conduit. Use a solvent weld for connections.

Protect shop-cut threads from corrosion under the standards shown in the following table:

Shop-Cut Thread Corrosion Protection

Conduit	Standard
Types 1 and 2	ANSI C80.1
Type 5	ANSI C80.6

Apply 2 coats of unthinned, organic zinc-rich primer to metal conduit before painting. Use a primer on the Authorized Material List for organic zinc-rich primers. Do not use aerosol cans. Do not remove shop-installed conduit couplings.

For conduits, paint:

1. All exposed threads
2. Field-cut threads, before installing conduit couplings to metal conduit
3. Damaged surfaces on metal conduit

If a Type 2 conduit or conduit coupling coating is damaged:

1. Clean the conduit or fitting and paint it with 1 coat of rubber-resin-based adhesive under the manufacturer's instructions
2. Wrap the damaged coating with at least 1 layer of 2-inch-wide, 20 mils-minimum-thickness, PVC tape under ASTM D1000 with a minimum tape overlap of 1/2 inch

You may repair damaged spots of 1/4 inch or less in diameter in the thermoplastic coating by painting with a brushing-type compound supplied by the conduit manufacturer.

If factory bends are not used, bend the conduit to a radius no less than 6 times its inside diameter without crimping or flattening it. Comply with the bending requirements shown in the following table:

Conduit-Bending Requirements

Type	Requirement
1	Use equipment and methods under the conduit manufacturer's instructions.
2	Use a standard bending tool designed for use on thermoplastic-coated conduit. The conduit must be free of burrs and pits.
3	Use equipment and methods under the conduit manufacturer's instructions. Do not expose the conduit to a direct flame.
5	Use equipment and methods under the conduit manufacturer's instructions.

Install pull tape with at least 2 feet of slack in each end of the conduit that will remain empty. Attach the tape's ends to the conduit.

Install conduit terminating in a standard or pedestal from 2 to 3 inches above the foundation. Slope the conduit toward the handhole opening.

Terminate conduit installed through the bottom of a nonmetallic pull box 2 inches above the bottom and 2 inches from the wall closest to the direction of the run.

87-1.03B(2) Conduit Installation for Structures

87-1.03B(2)(a) General

Paint exposed Type 1 conduit the same color as the structure.

Install galvanized steel hangers, steel brackets, and other fittings to support conduit in or on a wall or bridge.

87-1.03B(2)(b) New Structures

Seal and make watertight the conduits which lead to soffits, wall-mounted luminaires, other lights, and fixtures located below the pull box grade.

If you place a conduit through the side of a nonmetallic pull box, terminate the conduit 2 inches from the wall and 2 inches above the bottom. Slope the conduit toward the top of the box to facilitate pulling conductors.

For ease of installation and if authorized, you may use Type 4 conduit instead of Type 1 conduit for the final 2 feet of conduit entering a pull box in a reinforced concrete structure.

Install an expansion fitting where a conduit crosses an expansion joint in a structure. Each expansion fitting for metal conduit must include a copper bonding jumper having the ampacity as specified in NEC.

Install an expansion-deflection fitting for an expansion joint with a 1-1/2-inch movement rating. The fitting must be watertight and include a molded neoprene sleeve, a bonding jumper, and 2 silicon bronze or zinc-plated iron hubs.

For an expansion joint with a movement rating greater than 1-1/2 inches, install the expansion-deflection fitting as shown.

For conduit installed inside of bridge structures, you must:

1. Install precast concrete cradles made of minor concrete and commercial-quality welded wire fabric. The minor concrete must contain a minimum of 590 lb of cementitious material per cubic yard. The cradles must be moist cured for a minimum of 3 days.
2. Bond precast concrete cradles to a wall or bridge superstructure with one of the following:
   2.1. Epoxy adhesive for bonding freshly-mixed concrete to hardened concrete.
   2.2. Rapid-set epoxy adhesive for pavement markers.
   2.3. Standard-set epoxy adhesive for pavement markers.
3. Use a pipe sleeve or form an opening for a conduit through a bridge superstructure. The sleeve or opening through a prestressed member or conventionally reinforced precast member must be:
   3.1. Oriented transverse to the member.
   3.2. Located through the web.
   3.3. No more than 4 inches in size.
4. Wrap the conduit with 2 layers of asphalt felt building paper and securely tape or wire the paper in place for a conduit passing through a bridge abutment wall. Fill the space around the conduit with mortar under section 51-1, except the proportion of cementitious material to sand must be 1 to 3. Fill the space around the conduits after prestressing is completed.

Thread and cap a conduit installed for future use in structures. Mark the location of the conduit's end in a structure, curb, or wall directly above the conduit with a *Y* that is 3 inches tall.

87-1.03B(2)(c) Existing Structures

Run surface-mounted conduit straight and true, horizontal or vertical on the wall, and parallel to walls on ceilings or similar surfaces. Support the conduit at a maximum of 5-foot intervals where needed to prevent vibration or deflection. Support the conduit using galvanized, malleable-iron, conduit clamps, and clamp backs secured with expansion anchorage devices complying with section 75-3.02C. Use the largest diameter of galvanized, threaded studs that will pass through the mounting hole in the conduit clamp.

87-1.03B(3) Conduit Installation Underground

87-1.03B(3)(a) General

Install conduit to a depth of:

1. 14 inches for the trench-in-pavement method
2. 18 inches, minimum, under sidewalk and curbed paved median areas
3. 42 inches, minimum, below the bottom of the rail of railroad tracks

4. 30 inches, minimum, everywhere else below grade

Place conduit couplings at a minimum of 6 inches from the face of a foundation.

Place a minimum of 2 inches of sand bedding in a trench before installing Type 2 or Type 3 conduit and 4 inches of sand bedding over the conduit before placing additional backfill material.

If installing conduit within the limits of hazardous locations as specified in NEC for Class I, division 1, install and seal Type 1 or Type 2 conduit with explosion-proof sealing fittings.

87-1.03B(3)(b) Conduit Installation under Paved Surfaces

You may lay conduit on existing pavement within a new curbed median constructed on top.

Install conduit under existing pavement by the jacking or drilling methods. You may use the trench-in-pavement method for either of the following conditions:

1. If conduit is to be installed behind the curb under the sidewalk
2. If the delay to vehicles will be less than 5 minutes

Do not use the trench-in-pavement method for conduit installations under freeway lanes or freeway-to-freeway connector ramps.

87-1.03B(3)(c) Reserved

87-1.03B(3)(d) Conduit Installation under Railroad Tracks

Install Type 1 or Type 2 conduit with a minimum diameter of 1-1/2 inches under railroad tracks. If you use the jacking or drilling method to install the conduit, construct the jacking pit a minimum of 13 feet from the tracks' centerline at the near side of the pit. Cover the jacking pit with planking if left overnight.

87-1.03B(4) Reserved

87-1.03B(5) Conduit Installation by the Jacking or Drilling Method

Keep the jacking or drilling pit 2 feet away from the pavement's edge. Do not weaken the pavement or soften the subgrade with excessive use of water.

If an obstruction is encountered, obtain authorization to cut small holes in the pavement to locate or remove the obstruction.

You may install Type 2 or Type 3 conduit under the pavement if a hole larger than the conduit's diameter is predrilled. The predrilled hole must be less than one and half the conduit's diameter.

Remove the conduit used for drilling or jacking and install new conduit for the completed work.

87-1.03B(6) Conduit Installation by the Trenching-In-Pavement Method

Install conduit by the trenching-in-pavement method using a trench approximately 2 inches wider than the conduit's outside diameter but not exceeding 6 inches in width.

Where additional pavement is to be placed, you must complete the trenching before the final pavement layer is applied.

If the conduit shown is to be installed under the sidewalk, you may install it in the street within 3 feet of and parallel to the face of the curb. Install pull boxes behind the curb.

Cut the trench using a rock-cutting excavator. Minimize the shatter outside the removal area of the trench.

Dig the trench by hand to the required depth at pull boxes.

Place conduit in the trench.

Backfill the trench with minor concrete to the pavement's surface by the end of each work day. If the trench is in asphalt concrete pavement and no additional pavement is to be placed, backfill the top 0.10 foot of the trench with minor HMA within 3 days after trenching.

87-1.03C Installation of Pull Boxes

87-1.03C(1) General

Install pull boxes no more than 200 feet apart.

You may install larger pull boxes than specified or shown and additional pull boxes to facilitate the work except in structures.

Install a pull box on a bed of crushed rock and grout it before installing conductors. The grout must be from 0.5 to 1 inch thick and sloped toward the drain hole. Place a layer of roofing paper between the grout and the crushed rock sump. Make a 1-inch drain hole through the grout at the center of the pull box.

Set the pull box such that the top is 1-1/4 inches above the surrounding grade in unpaved areas and leveled with the finished grade in sidewalks and other paved areas.

Place the cover on the box when not working in it.

Grout around conduits that are installed through the sides of the pull box.

Bond and ground the metallic conduit before installing conductors and cables in the conduit.

Bond metallic conduits in a nonmetallic pull box using bonding bushings and bonding jumpers.

Do not install pull boxes in concrete pads, curb ramps, or driveways.

Reconstruct the sump of a pull box if disturbed by your activities. If the sump was grouted, remove and replace the grout.

87-1.03C(2) Nontraffic Pull Boxes

If you bury a nontraffic pull box, set the box such that the top is 6 to 8 inches below the surrounding grade. Place a 20-mil-thick plastic sheet made of HDPE or PVC virgin compounds to prevent water from entering the box.

Place mortar between a nontraffic pull box and a pull box extension.

Where a nontraffic pull box is in the vicinity of curb in an unpaved area, place the box adjacent to the back of the curb if practical.

Where a nontraffic pull box is adjacent to a post or standard, place the box within 5 feet upstream from traffic if practical.

If you replace the cover on a nontraffic pull box, anchor it to the box.

87-1.03C(3) Traffic Pull Boxes

Place minor concrete around and under a traffic pull box.

Bolt the steel cover to the box when not working in it.

Bond the steel cover to the conduit with a jumper and bolt it down after installing the conductors and cables.

87-1.03C(4) Structure Pull Boxes

Bond metallic conduit in a metal pull box in a structure using locknuts, inside and outside of the box, bonding bushings, and bonding jumpers connected to bonding wire running in the conduit system.

87-1.03D Reserved

87-1.03E Excavating and Backfilling for Electrical Systems

87-1.03E(1) General

Notify the Engineer at least 72 hours before starting excavation activities.

Dispose of surplus excavated material.

Restrict closures for excavation on a street or highway to 1 lane at a time unless otherwise specified.

87-1.03E(2) Trenching

Dig a trench for the electrical conduits or direct burial cables. Do not excavate until the conduit or direct burial cable will be installed.

Place excavated material in a location that will not interfere with traffic or surface drainage.

After placing the conduit or direct burial cable, backfill the trench with the excavated material. Compact the backfill placed outside the hinge point of slopes and not under pavement to a minimum relative compaction of 90 percent.

Compact the backfill placed within the hinge points and in areas where pavement is to be constructed to a minimum relative compaction of 95 percent.

Restore the sidewalks, pavement, and landscaping at a location before starting excavation at another location.

87-1.03E(3) Concrete Pads, Foundations, and Pedestals

Construct foundations for standards, poles, metal pedestals, and posts under section 56-3.

Construct concrete pads, foundations, and pedestals for controller cabinets, telephone demarcation cabinets, and service equipment enclosures on firm ground.

Install anchor bolts using a template to provide proper spacing and alignment. Moisten the forms and ground before placing the concrete. Keep the forms in place until the concrete sets for at least 24 hours to prevent damage to the surface.

Use minor concrete for pads, foundations, and pedestals.

In unpaved areas, place the top of the foundation 6 inches above the surrounding grade, except place the top:

1. 1 foot 6 inches above the grade for Type M and 336L cabinets
2. 1 foot 8 inches above the grade for Type C telephone demarcation cabinets
3. 2 inches above the grade for Type G and Type A cabinets and Type III service equipment enclosures

The pad must be 2 inches above the surrounding grade.

In and adjacent to the sidewalk and other paved areas, place the top of the foundation 4 inches above the surrounding grade, except place the top:

1. 1 foot 6 inches above the grade for Type M and 336L cabinets
2. 1 foot 8 inches above the grade for Type C telephone demarcation cabinets
3. Level with the finished grade for Type G and Type A cabinets and Type III service equipment enclosures

The pad must be level with the finished grade.

Apply an ordinary surface finish under section 51-1.03F.

Allow the foundation to cure for at least 7 days before installing any equipment.

87-1.03F Conductors and Cable Installations

87-1.03F(1) General

The installation of conductors and cables includes splicing conductors and attaching the terminals and connectors to the conductors.

Clean the conduit and pull all conductors and cables as a unit.

If new conductors or cables are to be added in an existing conduit:

1 Remove the content
2. Clean the conduit
3. Pull both old and new conductors and cables as a unit

Wrap conductors and secure cables to the end of the conduit in a pull box.

Seal the ends of conduits with a sealing compound after installing conductors or cables.

Neatly arrange conductors and cables inside pull boxes and cabinets. Tie the conductors and cables together with self-clinching nylon cable ties or enclose them in a plastic tubing or raceway.

Identify conductors and cables by direct labeling, tags, or bands fastened in such a way that they will not move. Use mechanical methods for labeling.

Provide band symbol identification on each conductor or each group of conductors comprising a signal phase in each pull box and near the end of terminated conductors.

Tape the ends of unused conductors and cables in pull boxes to form a watertight seal.

Do not connect the push-button or accessible pedestrian signal neutral conductor to the signal neutral conductor.

87-1.03F(2) Cables

87-1.03F(2)(a) General

Reserved

87-1.03F(2)(b) Reserved

87-1.03F(2)(c) Copper Cables

87-1.03F(2)(c)(i) General

Reserved

87-1.03F(2)(c)(ii) Detector Lead-in Cables

Install a Type B or C detector lead-in cable in conduit.

Waterproof the ends of the lead-in cable before installing it in the conduit to prevent moisture from entering the cable.

Splice loop conductors for each direction of travel for the same phase, terminating in the same pull box, to a separate lead-in cable running from the pull box adjacent to the loop detector to a sensor unit mounted in the controller cabinet. Install the lead-in cable without splices except at the pull box.

Verify in the presence of the Engineer that the loops are operational before making the final splices between loop conductors and the lead-in cable.

Identify and tag each lead-in cable with the detector designation at the cabinet and pull box adjacent to the loops.

87-1.03F(2)(c)(iii) Conductors Signal Cables

Do not splice signal cables except for a 28-conductor cable.

Provide identification at the ends of terminated conductors in a cable as shown.

Provide identification for each cable in each pull box showing the signal standard to which it is connected except for the 28-conductor cable.

Connect conductors in a 12-conductor cable as shown in the following table:

12CSC Color Code and Functional Connection

Color code	Termination	Phase
Red	Red signal	2, 4, 6, or 8
Yellow	Yellow signal	2, 4, 6, or 8
Brown	Green signal	2, 4, 6, or 8
Red/black stripe	Red signal	1, 3, 5, or 7
Yellow/black stripe	Yellow signal	1, 3, 5, or 7
Brown/black stripe	Green signal	1, 3, 5, or 7
Black/red stripe	Spare or as required for red or *DONT WALK*	--
Black/white stripe	Spare or as required for yellow	--
Black	Spare or as required for green or *WALK*	--
Red/white stripe	Pedestrian signal *DONT WALK*	--
Brown/white stripe	Pedestrian signal *WALK*	--
White	Terminal block	Neutral

Provide identification for each 28-conductor cable C1 or C2 in each pull box. The cable labeled *C1* must be used for signal phases 1, 2, 3, and 4. The cable labeled *C2* must be used for signal phases 5, 6, 7, and 8.

Connect conductors in a 28-conductor cable as shown in the following table:

28CSC Color Code and Functional Connection

Color code	Termination	Phase
Red/black stripe	Red signal	2 or 6
Yellow/black stripe	Yellow signal	2 or 6
Brown/black stripe	Green signal	2 or 6
Red/orange stripe	Red signal	4 or 8
Yellow/orange stripe	Yellow signal	4 or 8
Brown/orange stripe	Green signal	4 or 8
Red/silver stripe	Red signal	1 or 5
Yellow/silver stripe	Yellow signal	1 or 5
Brown/silver stripe	Green signal	1 or 5
Red/purple stripe	Red signal	3 or 7
Yellow/purple stripe	Yellow signal	3 or 7
Brown/purple stripe	Green signal	3 or 7
Red/2 black stripes	Pedestrian signal *DONT WALK*	2 or 6
Brown/2 black stripes	Pedestrian signal *WALK*	2 or 6
Red/2 orange stripes	Pedestrian signal *DONT WALK*	4 or 8
Brown/2 orange stripes	Pedestrian signal *WALK*	4 or 8
Red/2 silver stripes	Overlap A, C	OLA[a], OLC[a]
Brown/2 silver stripes	Overlap A, C	OLA[c], OLC[c]
Red/2 purple stripes	Overlap B, D	OLB[a], OLD[a]
Brown/2 purple stripes	Overlap B, D	OLB[c], OLD[c]
Blue/black stripe	Pedestrian push button	2 or 6
Blue/orange stripe	Pedestrian push button	4 or 8
Blue/silver stripe	Overlap A, C	OLA[b], OLC[b]
Blue/purple stripe	Overlap B, D	OLB[b], OLD[b]
White/black stripe	Pedestrian push button common	--
Black/red stripe	Railroad preemption	--
Black	Spare	--
White	Terminal block	Neutral

OL = Overlap; A, B, C, and D = Overlapping phase designation

[a]For red phase designation

[b]For yellow phase designation

[c]For green phase designation

Use the neutral conductor only with the phases associated with that cable. Do not intermix neutral conductors from different cables except at the signal controller.

87-1.03F(2)(c)(iv) Signal Interconnect Cable

For a signal interconnect cable, provide a minimum of 6 feet of slack inside each controller cabinet.

Do not splice the cable unless authorized.

If splices are authorized, insulate the conductor splices with heat-shrink tubing and overlap the insulation at least 0.6 inch. Cover the splice area of the cable with heat-shrink tubing and overlap the cable jacket at least 1-1/2 inches. Provide a minimum of 3 feet of slack at each splice.

87-1.03F(3) Conductors

87-1.03F(3)(a) General

Do not run conductors to a terminal block on a standard unless they are to be connected to a signal head mounted on that standard.

Provide 3 spare conductors in all conduits containing ramp metering and traffic signal conductors.

Install a separate conductor for each terminal of a push button assembly and accessible pedestrian signal.

Provide conductor slack to comply with the requirements shown in the following table:

Conductor Slack Requirements

Location	Slack (feet)
Signal standard	1
Lighting standard	1
Signal and lighting standard	1
Pull box	3
Splice	3
Standards with slip base	0

87-1.03F(3)(b) Reserved

87-1.03F(3)(c) Copper Conductors

87-1.03F(3)(c)(i) General

Install a minimum no. 8, insulated, grounding copper conductor in conduit and connect it to all-metal components.

Where conductors from different service points occupy the same conduit or standard, enclose the conductors from one of the services in flexible or rigid metal conduit.

87-1.03F(3)(c)(ii) Inductive Loop Conductors

Install a Type 1 or 2 inductive loop conductor except use Type 2 for Type E loop detectors.

Install the conductor without splices except at the pull box.

87-1.03F(4) Manual Installation Method

Use an inert lubricant for placing conductors and cables in conduit.

Pull the conductors and cables into the conduit by hand using pull tape.

87-1.03G Equipment Identification Characters

The Engineer provides you with a list of the equipment identification characters.

Stencil the characters or apply the reflective self-adhesive labels to a clean surface.

Treat the edges of self-adhesive characters with an edge sealant.

Place the characters on the side facing traffic on:

1. Front doors of cabinets and service equipment enclosures.
2. Wood poles, fastened with 1-1/4-inch aluminum nails, for pole mounted enclosures
3. Adjacent bent or abutment at approximately the same station as an illuminated sign or soffit luminaire
4. Underside of the structure adjacent to the illuminated sign or soffit luminaire if no bent or abutment exists nearby
5. Posts of overhead signs
6. Standards

Before placing new characters on existing or relocated equipment, remove the existing characters.

87-1.03H Conductor and Cables Splices

87-1.03H(1) General

You may splice:

1. Grounded conductors in a pull box
2. Accessible pedestrian signal and push bottom conductors in a pull box
3. Ungrounded signal conductors in a pull box if signals are modified

4. Ungrounded signal conductors to a terminal compartment or a signal head on a standard with conductors of the same phase in the pull box adjacent to the standard
5. Ungrounded lighting circuit conductors in a pull box if lighting circuits are modified

Solder all splices using the hot iron, pouring, or dipping method. Do not perform open-flame soldering.

87-1.03H(2) Splice Insulation Methods

Insulate splices in a multiconductor cable to form a watertight joint and to prevent moisture absorption by the cable.

Use heat-shrink tubing or Method B to insulate a splice.

Use heat-shrink tubing as follows:

1. Cover the splice area completely with an electrical insulating coating and allow it to dry.
2. Place mastic around each conductor before placing them inside the tubing. Use the type of mastic specified in the tubing manufacturer's instructions.
3. Heat the area under the manufacturer's instructions. Do not perform open-flame heating. After contraction, each end of the heat-shrink tubing or the open end of the tubing's end cap must overlap the conductor insulation at least 1-1/2 inches.
4. Cover the entire splice with an electrical insulating coating and allow it to dry.

Use Method B as follows:

1. Cover the splice area completely with an electrical insulating coating and allow it to dry.
2. Apply 3 layers of half-lapped, 80-mils, PVC tape.
3. Apply 2 layers of 120-mils, butyl-rubber, stretchable tape with liner.
4. Apply 3 layers of half-lapped, 6-mils, PVC, pressure-sensitive, adhesive tape.
5. Cover the entire splice with an electrical insulating coating and allow it to dry.

87-1.03I Connectors and Terminals

Apply connectors and terminals to cables and conductors using a crimping compression tool under the manufacturer's instructions. The tool must prevent opening of the handles until the crimp is completed.

Install crimp-style terminal lugs on stranded conductors smaller than no. 14.

Solder no. 8 and smaller conductors to connectors and terminal lugs.

87-1.03J Standards, Poles, Pedestals, and Posts

Install standards, poles, pedestals, and posts under section 56-3.

Ground standards with a handhole by attaching a bonding jumper from the bolt or lug inside the standard to a metal conduit or to the grounding wire in the adjacent pull box. The bonding jumper must be visible when the handhole cover is removed.

Ground standards without a handhole or standards with a slip base by attaching a bonding jumper to all anchor bolts using ground clamps and connecting it to a metal conduit or to the grounding wire in the adjacent pull box. The bonding jumper must be visible after mortar has been placed on the foundation.

87-1.03K Reserved

87-1.03L Utility Service

87-1.03L(1) General

Install the service equipment early enough to allow the utility to complete its work before completion of the electrical work.

At least 15 days before permanent electrical and telecommunication service is required, request the service connections for permanent installations. The Department arranges with the utilities for completion of the connections and pays all costs and fees required by the utilities.

87-1.03L(2) Electric Service

87-1.03L(2)(a) General

If service equipment is to be installed on a utility-owned pole, furnish and install the conduit, conductors, pull boxes, and other necessary material to complete the service installation. The service utility decides the position of the riser and equipment on the pole.

87-1.03L(2)(b) Electric Service for Irrigation

Establishing electric service for irrigation includes installing conduit, conductors, and pull boxes and making connections from the service point to the irrigation controllers.

87-1.03L(2)(c) Electric Service for Booster Pumps

Establishing electric service for a booster pump includes installing conduit, conductors, and pull boxes and making connections from the service point to the booster pump enclosure.

87-1.03L(3) Telecommunications Service

Establishing telecommunication service includes installing conduit, conductors, and pull boxes and making connections from the service point to the telephone demarcation cabinet.

87-1.03M Photoelectric Controls

Mount the photoelectric unit on the top of the pole for Type I, II, and III photoelectric controls. Use mounting brackets where pole-top mounting is not possible. Orient the photoelectric unit to face north.

Mount the enclosure at a height of 6 feet above finished grade on the same standard as the photoelectric unit.

Install a minimum 100 VA, 480/120 V(ac) transformer in the contactor enclosure to provide 120 V(ac) for the photoelectric control unit when switching 480 V(ac), 60 Hz circuits.

87-1.03N Fused Splice Connectors

Install a fuse splice connector in each ungrounded conductor for luminaires mounted on standards. The connector must be located in the pull box adjacent to the standard.

Crimp the connector terminals onto the ungrounded conductors using a tool under the manufacturer's instructions. Insulate the terminals and make them watertight.

87-1.03O Grounding Electrodes

Install a grounding electrode for each cabinet, service equipment enclosure, and transformer.

Attach a grounding conductor from the electrode using either a ground clamp or exothermic weld. Connect the other end of the conductor to the cabinet, service equipment enclosure, and transformer.

87-1.03P Service Equipment Enclosures

Installing a service equipment enclosure includes constructing the foundation and pad and installing conduit, adjacent pull boxes, and grounding electrode.

Locate the foundation such that the minimum clearance around the front and back of the enclosure complies with NEC, article 110.26, "Spaces About Electrical Equipment, (600 V, nominal or less)."

Bond and ground metal conduit as specified in NEC and by the service utility except the grounding electrode conductor must be no. 6 or larger.

If circuit breakers and components do not have a description on engraved phenolic nameplates, install them using stainless steel rivets or screws under section 86-1.02P(2).

87-1.03Q Cabinets

87-1.03Q(1) General

Installing a cabinet includes constructing the foundation and pad and installing conduit, adjacent pull boxes, and grounding electrode.

Apply a mastic or caulking compound before installing the cabinet on the foundation to seal the openings.

Connect the field wiring to the terminal blocks in the cabinet. Neatly arrange and lace or enclose the conductors in plastic tubing or raceway. Terminate the conductors with properly sized captive or spring spade terminals. Apply a crimp-style connector and solder them.

Install and solder a spade-type terminal on no. 12 and smaller field conductors and a spade-type or ring-type terminal on conductors larger than no. 12.

87-1.03Q(2) Department-Furnished Controller Cabinets

Arrange for the delivery of Department-furnished controller cabinets.

87-1.03Q(3) Reserved

87-1.03Q(4) Telephone Demarcation Cabinets

Installing a telephone demarcation cabinet includes installing conduit, cable, and pull boxes to the controller cabinet.

Install the cabinet with the back toward the nearest lane of traffic.

87-1.03R Signal Heads

87-1.03R(1) General

Installing a signal head includes mounting the heads on standards and mast arms, installing backplates and visors, and wiring conductors to the terminal blocks.

Keep the heads covered or direct them away from traffic until the system is ready for operation.

87-1.03R(2) Signal Faces

Use the same brand and material for the signal faces at each location.

Program the programmable visibility signal faces under the manufacturer's instructions. The indication must be visible only in those areas or lanes to be controlled.

87-1.03R(3) Backplates

Install backplates using at least six 10-24 or 10-32 self-tapping and locking stainless steel machine screws and flat washers.

If a plastic backplate requires field assembly, attach each joint using at least four no.10 machine screws. Each machine screw must have an integral or captive flat washer, a hexagonal head slotted for a standard screwdriver, and either a locking nut with an integral or captive flat washer or a nut, flat washer, and lock washer. Machine screws, nuts, and washers must be stainless steel or steel with a zinc or black oxide finish.

If a metal backplate has 2 or more sections, fasten the sections with rivets or aluminum bolts peened after assembly to avoid loosening.

Install the backplate such that the background light is not visible between the backplate and the signal face or between sections.

87-1.03R(4) Signal Mounting Assemblies

Install a signal mounting assembly such that its members are arranged symmetrically and plumb or level. Orient each mounting assembly to allow maximum horizontal clearance to the adjacent roadway.

For a bracket-mounted assembly, bolt the terminal compartment or pole plate to the pole or standard.

In addition to the terminal compartment mounting, attach the upper pipe fitting of Type SV-1-T with 5 sections or a SV-2-TD to the standard or pole using the mounting detail for signal heads without a terminal compartment.

Use a 4-1/2-inch slip fitter and set screws to mount an assembly on a post top.

After installing the assembly, clean and paint the exposed threads of the galvanized conduit brackets and bracket areas damaged by the wrench or vise jaws. Use a wire brush to clean and apply 2 coats of unthinned, organic zinc-rich primer. Do not use an aerosol can to apply the primer.

Install the conductors in the terminal compartment and secure the cover.

87-1.03S Pedestrian Signal Heads

Installing a pedestrian signal head includes mounting the heads on standards and wiring conductors to the terminal blocks.

Install the pedestrian signal mounting assembly under section 87-1.03R(4).

Use the same brand and material for the pedestrian signal faces at each location.

Install a pedestrian signal face such that its members are arranged symmetrically and plumb or level.

87-1.03T Accessible Pedestrian Signals

Use the same brand for the accessible pedestrian signals at each location.

Install an accessible pedestrian signal and the R10 series sign on the crosswalk side of the standard.

Attach the accessible pedestrian signal to the standard with self-tapping screws.

Attach the sign to the standard using 2 straps and saddle brackets.

Point the arrow on the accessible pedestrian signal in the same direction as the corresponding crosswalk.

Furnish the equipment and hardware to set up and calibrate the accessible pedestrian signal.

Arrange to have a manufacturer's representative at the job site to program the accessible pedestrian signal with an audible message or tone.

87-1.03U Push Button Assemblies

Install the push button assembly and the R10 series sign on the crosswalk side of the standard.

Attach the sign to the assembly for Type B assemblies.

Attach the sign to the standard using 2 straps and saddle brackets for Type C assemblies.

You may use straps and saddle brackets to secure the push button to the standard.

Use a slip fitter to secure the assembly on top of a 2-1/2-inch-diameter post.

87-1.03V Detectors

87-1.03V(1) General

Installing a detector includes installing inductive loop conductors, sealant, conduit, and pull boxes.

Center the detectors in the traffic lanes.

Do not splice the detector conductor.

87-1.03V(2) Inductive Loop Detectors

Mark the location of the inductive loop detectors such that the distance between the side of the loop and a lead-in saw cut from an adjacent detector is at least 2 feet. The distance between lead-in saw cuts must be at least 6 inches.

Saw cut the slots under section 13-4.03E(7). The bottoms of the slots must be smooth with no sharp edges. For Type E detector loops, saw the slots such that the sides are vertical.

Wash the slots clean using water and blow dry them with compressed air to remove all moisture and debris.

Identify the start of the conductor.

Waterproof the ends of a Type 2 loop conductor before installing it in the conduit to prevent moisture from entering the cable.

Install the loop conductor in the slots and lead-in saw cuts using a 3/16- to 1/4-inch-thick wood paddle. Hold the conductors in place at the bottom of the slot with wood paddles during placement of the sealant.

Wind adjacent loops on the same sensor unit channel in opposite directions.

Twist the conductors for each loop into a pair consisting of a minimum of 2 turns per foot before placing them in the lead-in saw cut and the conduit leading to the pull box. Do not install more than 2 twisted pairs of conductors per lead-in saw cut.

Provide 5 feet of slack in the pull box.

Test each loop for continuity, circuit resistance, and insulation resistance before filling the slots with sealant.

Remove excess sealant from the adjacent road surface before it sets. Do not use solvents to remove the excess.

Identify the loop conductor pair in the pull box, marking the start with the letter *S* and the end with the letter *F*. Band conductors in pairs by lane in the pull box adjacent to the loops and in the cabinet. Identify each pair with the detector designation and loop number.

Install the conductors in a compacted layer of HMA immediately below the uppermost layer if more than one layer will be placed. Install the loop conductors before placing the uppermost layer of HMA. Fill the slot with a sealant flush to the surface.

Install the conductors in the existing pavement if one layer of HMA is to be placed. Install the loop conductors before placing the layer of HMA. Fill the slot with a sealant flush to the surface.

87-1.03V(3) Preformed Inductive Loop Detectors

Construct a preformed inductive loop detector consisting of 4 turns in the loop and a lead-in conductor pair twisted at least 2 turns per foot all encased in conduit and sealed to prevent water penetration. The detector must be 6-foot square unless shown otherwise.

Construct the loop detector using a minimum 3/8-inch Schedule 40 or Schedule 80 PVC or polypropylene conduit and no. 16 or larger conductor with Type THWN or TFFN insulation.

In new roadways, place the detector in the base course with the top of the conduit flush with the top of the base. Cover with HMA or concrete pavement. Protect the detector from damage before and during pavement placement.

In new reinforced concrete bridge decks, secure the detector to the top of the uppermost layer of reinforcing steel using nylon wire ties. Hold the detector parallel to the bridge deck using PVC or polypropylene spacers where necessary. Place conduit for lead-in conductors between the uppermost 2 layers of reinforcing steel.

Do not install detectors in existing bridge decks unless authorized.

Install a detector in existing pavement before placement of concrete or HMA as follows:

1. Saw cut slots at least 1-1/4 inches wide into the existing pavement.
2. Place the detector in the slots. The top of the conduit must be at least 2 inches below the top of the pavement.
3. Test each loop circuit for continuity, circuit resistance, and insulation resistance.
4. Fill saw cuts with elastomeric or hot melt rubberized asphalt sealant for asphalt concrete pavement and with epoxy sealant or hot melt rubberized asphalt sealant for concrete pavement.

87-1.03W Sealants

87-1.03W(1) General

Reserved

87-1.03W(2) Elastomeric Sealant

Apply an elastomeric sealant with a pressure feed applicator.

87-1.03W(3) Asphaltic Emulsion Sealant

Asphaltic emulsion sealant must:

1. Be used for filling slots in asphalt concrete pavement of a maximum width of 5/8 inch
2. Not be used on concrete pavement or where the slope causes the material to run from the slot
3. Be thinned under the manufacturer's instructions
4. Be placed when the air temperature is at least 45 degrees F

87-1.03W(4) Hot-Melt Rubberized Asphalt Sealant

Melt the sealant in a jacketed, double-boiler-type, melting unit. The temperature of the heat transfer medium must not exceed 475 degrees F.

Apply the sealant with a pressure feed applicator or a pour pot when the surface temperature of the pavement is greater than 40 degrees F.

87-1.03X Reserved

87-1.03Y Transformers

Installing a transformer includes placing the transformer inside a pull box, a cabinet, or an enclosure.

Wire the transformer for the appropriate voltage.

Ground the secondary circuit of the transformer as specified in the NEC.

87-1.03Z Reserved

87-1.04 PAYMENT

Not Used

87-2 LIGHTING SYSTEMS

87-2.01 GENERAL

87-2.01A Summary

Section 87-2 includes specifications for constructing lighting systems.

Lighting system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Standards
6. Luminaires
7. Service equipment enclosure
8. Photoelectric control
9. Fuse splice connectors
10. High mast lighting assemblies

The components of a lighting system are shown on the project plans.

87-2.01B Definitions

Reserved

87-2.01C Submittals

Submit a certificate of compliance and test data for the high mast lighting luminaires.

87-2.01D Quality Assurance

Reserved

87-2.02 MATERIALS

87-2.02A General

Reserved

87-2.02B High Mast Lighting Assemblies

A high mast lighting assembly includes the foundation, pole, lowering device system, luminaires, and control pedestal.

Each luminaire in a high mast lighting assembly must include a housing, an optical system, and a ballast.

The housing must be made of aluminum.

A painted or powder-coated housing for a high mast lighting luminaire must be able to withstand a 1,000-hour salt spray test as specified in ASTM B117.

The optical system, consisting of the reflector, refractor or lens, lamp socket, and lamp, must be in a sealed chamber. The chamber must be sealed by a gasket between the reflector and refractor or lens and a gasket between the reflector and lamp socket. The chamber must have a separate filter or filtering gasket for flow of air.

An asymmetrical luminaire must have a refractor or reflector that is rotatable 360 degrees around a vertical axis to orient the distribution of light.

The luminaire must have a slip fitter for mounting on a 2-inch horizontal pipe tenon and must be adjustable ±3 degrees from the axis of the tenon.

The reflector must have a specular surface made of silvered glass or aluminum protected by either an anodized finish or a silicate film. The reflector must be shaped such that a minimum of light is reflected through the arc tube of the lamp.

The refractor and lens must be made of heat-resistant glass.

The lamp socket must be a porcelain-enclosed, mogul-multiple type. The shell must contain integral lamp grips to ensure electrical contact under conditions of normal vibrations. The socket must be rated for 1,500 W, 600 V(ac) and 4,000 V(ac) pulse for a 400 W lamp and 5,000 V(ac) pulse for a 1,000 W lamp.

The luminaire must have a dual fuse holder for 2 fuses rated at 5 A, 480 V(ac). The fuses must be 13/32 inch by 1-1/2 inches, standard midget ferrule type with a nontime-delay feature.

The lamps must be vertical burning, protected from undue vibration, and prevented from backing out of the socket by a stainless steel clamp attached to the luminaire.

A 1,000 W metal halide lamp must have an initial output of 100,000 lumens and an average rated life of 12,000 hours based on 10 hours per start.

A 400 W high-pressure sodium lamp must have an initial output of 50,000 lumens. A 1,000 W high-pressure sodium lamp must have an initial output of 140,000 lumens.

The ballast for the luminaire must be a regulator type and have a core and coils, capacitors, and starting aid.

Ballast must be:

1. Mounted within a weatherproof housing that integrally attaches to the top of a luminaire support bracket and lamp support assembly
2. Readily removable without removing the luminaire from the bracket arm
3. Electrically connected to the optical assembly by a prewired quick disconnect

The ballast for a metal halide luminaire must comply with luminaire manufacturer's specifications.

The wattage regulation spread at any lamp voltage, from nominal through the life of the lamp, must vary no more than 22 percent for a 1,000 W lamp and a ±10 percent input voltage variation. The ballast's starting line current must be less than its operating current.

87-2.02C Soffit and Wall-Mounted Luminaires

87-2.02C(1) General

Soffit and wall-mounted luminaires must be weatherproof and corrosion resistant.

Each luminaire must include a 70 W high-pressure sodium lamp with a minimum average rated life of 24,000 hours. The lamp socket must be positioned such that the light center of the lamp is located within 1/2 inch of the designed light center of the luminaire.

Luminaire wiring must be SFF-2.

Flush-mounted soffit luminaire must have:

1. Metal body with two 1-inch-minimum conduit hubs and a means of anchoring the body into the concrete
2. Prismatic refractor made of heat-resistant polycarbonate:
    2.1. Mounted in a door frame
    2.2. With the street side identified
3. Aluminum reflector with a specular anodized finish
4. Ballast located either within the housing or in a ceiling pull box if shown
5. Lamp socket

The door frame assembly must be hinged, gasketed, and secured to the luminaire body with at least 3 machine screws.

A pendant soffit luminaire must be enclosed and gasketed and have an aluminum finish. Luminaire must have:

1. Aluminum reflector with a specular anodized finish
2. Refractor made of heat-resistant polycarbonate
3. Optical assembly that is hinged and latched for lamp access and a device to prevent dropping
4. Ballast designed for operation in a raintight enclosure
5. Galvanized metal box with a gasketed cover, 2 captive screws, and 2 chains to prevent dropping and for luminaire mounting

Wall-mounted luminaire must have:

1. Cast metal body
2. Prismatic refractor:
    2.1. Made of glass
    2.2. Mounted in a door frame
3. Aluminum reflector with a specular anodized finish
4. Integral ballast
5. Lamp socket
6. Gasket between the refractor and the body
7. At least 2 mounting bolts of minimum 5/16-inch diameter

A cast aluminum body of a luminaire to be cast into or mounted against concrete must have a thick coat of alkali-resistant bituminous paint on all surfaces to be in contact with the concrete.

87-2.02C(2) High-Pressure Sodium Lamp Ballasts

87-2.02C(2)(a) General

A high-pressure sodium lamp ballast must operate the lamp for its rated wattage.

Starting aids for a ballast must be interchangeable between ballasts of the same wattage and manufacturer without adjustment.

The ballast must be provided with a heat-generating component to serve as a heat sink. The capacitor must be placed at the maximum practicable distance from the heat-generating components or thermally shielded to limit the case temperature to 75 degrees C.

The transformer and inductor must be resin impregnated for protection against moisture. Capacitors, except for those in starting aids, must be metal cased and hermetically sealed.

The ballast must have a power factor of 90 percent or greater.

For the nominal input voltage and lamp voltage, the ballast design center must not vary more than 7.5 percent from the rated lamp wattage.

87-2.02C(2)(b) Regulator-Type Ballasts

A regulator-type ballast must be designed such that a capacitance variance of ±6 percent does not cause more than ±8 percent variation in the lamp wattage regulation.

The ballast must have a current crest factor not exceeding 1.8 for an input voltage variation of ±10 percent.

The lamp wattage regulation spread for a lag-type ballast must not vary by more than 18 percent for ±10 percent input voltage variations. The primary and secondary windings must be electrically isolated.

The lamp wattage regulation spread for a constant-wattage, autoregulator, lead-type ballast must not vary by more than 30 percent for ±10 percent input voltage variations.

87-2.02C(2)(c) Nonregulator-Type Ballasts

A nonregulator-type ballast must have a current crest factor not exceeding 1.8 for an input voltage variation of ±5 percent.

The lamp wattage regulation spread for an autotransformer or high reactance type ballast must not vary by more than 25 percent for ±5 percent input voltage variations.

87-2.03 CONSTRUCTION

87-2.03A General

Set the foundations for standards such that the mast arm is perpendicular to the centerline of the roadway.

Tighten the cap screws of the luminaire's clamping bracket to 10 ft-lb for LED and low-pressure luminaires.

Label the month and year of the installation inside the luminaire housing's door.

Perform the conductor and operational tests for the system.

87-2.03B High Mast Lighting Assemblies

Mount and connect the luminaires to the accessory support ring. Aim the asymmetrical luminaire to orient the distribution of light.

87-2.03C Soffit and Wall-Mounted Luminaires

For a flush-mounted soffit luminaire:

1. Prevent concrete from getting into the housing during pouring of the concrete for the structure
2. Install the luminaire with the axis vertical and the street side of the refractor oriented as indicated
3. Locate the luminaire to provide a minimum 2-foot clearance from the inside surface of the girders and 1-foot clearance from the near face of the diaphragm
4. Install the bridge soffit and ceiling pull box over the same lane

For a pendant soffit luminaire:

1. Cast in place the inserts for the no. 8 pull box during concrete placement for a new structure
2. Drill holes for expansion anchors to support the no. 8 pull box on existing structures
3. Bond the suspension conduit and luminaire to the pull box

For a wall-mounted luminaire, provide:

1. Extension junction box or ring on a new structure
2. 4 external mounting taps on an existing structure

Place the soffits or wall-mounted luminaires in operation as soon as practicable after the falsework has been removed from the structure.

If the Engineer orders soffit or wall-mounted luminaires to be activated before permanent power service is available, installing and removing the temporary power service is change order work.

87-2.04 PAYMENT

Not Used

87-3 SIGN ILLUMINATION SYSTEMS

87-3.01 GENERAL

87-3.01A Summary

Section 87-3 includes specifications for constructing sign illumination systems.

Sign illumination system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Sign lighting fixtures
6. Enclosure for the disconnect circuit breaker
7. Service equipment enclosure
8. Photoelectric control

The components of a sign illumination system are shown on the project plans.

87-3.01B Definitions

Reserved

87-3.01C Submittals

Submit the manufacturer's test data for the induction sign-lighting fixtures.

87-3.01D Quality Assurance

Reserved

87-3.02 MATERIALS

An induction sign-lighting fixture must include a housing with a door, reflector, refractor or lens, lamp, socket assembly, power coupler, high-frequency generator, fuse block, and fuses.

The fixture must comply with the isofootcandle curves as shown.

Fixture must weigh no more than 44 lb, be rated for 87 W at 120/240 V(ac), and have a mounting assembly made of one of the following materials:

1. Cast aluminum
2. Hot-dip galvanized steel plate
3. Galvanized steel plate finished with one of the following:
    3.1. Polymeric coating
    3.2. Same finish used for the housing

Housing must:

1. Be corrosion resistant and suitable for wet locations
2. Be above the top of the mounting rails at a maximum height of 12 inches
3. Have weep holes

Door must:

1. Hold a refractor or lens
2. Open without the use of special tools
3. Have a locking position at 50 degrees minimum from the plane of the door opening
4. Be hinged to the housing on the side of the fixture away from the sign panel
5. Have 2 captive latch bolts or other latching device

When the door is opened, it must lock in the 50 degrees position when an 85 mph, 3-second wind-gust load strikes the door from either side.

The housing and door must be manufactured of sheet or cast aluminum and have a gray powder coat or polyester paint finish. The sheet aluminum must comply with ASTM B209 or B209M for 5052-H32 aluminum sheet. External bolts, screws, hinges, hinge pins, and door closure devices must be corrosion resistant.

The housing and door must be gasketed. The thickness of the gasket must be a minimum of 1/4 inch.

Reflector must not be attached to the outside of the housing and must be:

1. Made of a single piece of aluminum with a specular finish
2. Protected with an electrochemically applied anodized finish or a chemically applied silicate film
3. Designed to drain condensation away from it
4. Secured to the housing with a minimum of 2 screws
5. Removable without removing any fixture parts

Refractor or lens must have a smooth exterior and must be manufactured from the materials shown in the following table:

Refractor and Lens Material Requirements

Component	Material
Flat lens	Heat-resistant glass
Convex lens	Heat-resistant, high-impact-resistant tempered glass
Refractor	Borosilicate heat-resistant glass

The refractor and convex lens must be designed or shielded such that no luminance is visible if the fixture is approached directly from the rear and viewed from below. If a shield is used, it must be an integral part of the door casting.

Lamp must:

1. Be an 85 W induction type with a fluorescent, phosphor-coated, interior wall
2. Have a minimum 70 percent light output of its original lumen output after 60,000 hours of operation
3. Have a minimum color-rendering index of 80
4. Be rated at a color temperature of 4,000K
5. Be removable with common hand tools

The lamp socket must be rated for 1,500 W and 600 V(ac) and be a porcelain-enclosed mogul type with a shell that contains integral lamp grips to ensure electrical contact under normal vibration conditions. The shell and center contact must be made of nickel-plated brass. The center contact must be spring loaded.

The power coupler must be removable with common hand tools.

High-frequency generator must:

1. Start and operate lamps at an ambient temperature of -25 degrees C or greater for the rated life of the lamp
2. Operate continuously at ambient air temperatures from -25 to 55 degrees C without a reduction in the generator life
3. Have a design life of at least 100,000 hours at 55 degrees C
4. Have an output frequency of 2.65 MHz ± 10 percent
5. Have radio frequency interference that complies with 47 CFR 18 regulations regarding harmful interference
6. Have a power factor greater than 90 percent and total harmonic distortion less than 10 percent

The high frequency generator must be mounted such that the fixture can be used as a heat sink and be replaceable with common hand tools.

Each fixture must include a barrier-type fuse block for terminating field connections. Fuse block must:

1. Be rated 600 V(ac)
2. Have box terminals
3. Be secured to the housing and accessible without removal of any fixture parts
4. Be mounted to leave a minimum of 1/2 inch of air space from the sidewalls of the housing
5. Be designed for easy removal of fuses with a fuse puller

The fixture's fuses must be 13/32-inch-diameter, 1-1/2-inch-long ferrule type and UL listed or NRTL certified. For a 120 V(ac) fixture, only the ungrounded conductor must be fused and a solid connection must be provided between the grounded conductor and the high frequency generator.

The fixture must be permanently marked with the manufacturer's brand name, trademark, model number, serial number, and date of manufacture on the inside and outside on the housing. The same information must be marked on the package.

If a wire guard is used, it must be made of a minimum 1/4-inch-diameter galvanized steel wire. The wires must be spaced to prevent rocks larger than 1-1/2-inch diameter from passing through the guard. The guard must be either hot-dip galvanized or electroplated zinc-coated as specified in ASTM B633, service condition SC4, with a clear chromate dip treatment.

87-3.03 CONSTRUCTION

Perform the conductor and operational tests for the system.

87-3.04 PAYMENT

Not Used

87-4 SIGNAL AND LIGHTING SYSTEMS

87-4.01 GENERAL

87-4.01A Summary

Section 87-4 includes specifications for constructing signal and lighting systems.

Signal and lighting system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Cables
6. Standards
7. Signal heads
8. Internally illuminated street name signs
9. Service equipment enclosure
10. Department-furnished controller assembly
11. Detectors
12. Telephone demarcation cabinet
13. Accessible pedestrian signals
14. Push button assemblies
15. Pedestrian signal heads
16. Luminaires
17. Photoelectric control
18. Fuse splice connectors
19. Battery backup system
20. Flashing beacons
21. Flashing beacon control assembly

The components of a signal and lighting system are shown on the project plans.

87-4.01B Definitions

Reserved

87-4.01C Submittals

Submit shop drawings showing the message for each internally illuminated street sign, including the size of letters, symbols, and arrows.

87-4.01D Quality Assurance

87-4.01D(1) General

Reserved

87-4.01D(2) Quality Control

87-4.01D(2)(a) General

Reserved

87-4.01D(2)(b) Battery Backup System

Notify the Engineer 48 hours before testing the battery backup system.

Test the system in the presence of the Engineer by turning off the power to the signal system at the service equipment enclosure. The signal system must run continuously for 30 minutes. If the battery backup system fails, correct the problem and retest the system for another 30 minutes. After successful completion of the test, turn the power on for the signal system.

87-4.02 MATERIALS

87-4.02A General

Reserved

87-4.02B Battery Backup System

A battery backup system includes the cabinet, batteries, and the Department-furnished electronics assembly.

The electronics assembly includes the inverter/charger unit, power transfer relay, and the battery harness.

87-4.02C Internally Illuminated Street Name Signs

An internally illuminated street name sign includes housing, brackets, sign panels, gaskets, ballast, lampholder, terminal blocks, conductors, and fuses.

An internally illuminated street sign must be designed and constructed to prevent deformation or failure when subjected to an 85 mph, 3-second wind-gust load as specified in the AASHTO publication, "Standard Specifications for Structural Supports of Highway Signs, Luminaires and Traffic Signals."

Sign must:

1. Be Types A or B
2. Have galvanized or cadmium-plated ferrous parts
3. Have screened weep holes
4. Have fasteners, screws, and hardware made of passive stainless steel, Type 302 or 304, or aluminum Type 6060-T6
5. Operate at a temperature from -20 to 74 degrees C

Photoelectric unit sockets are not allowed.

The housing must be constructed to resist torsional twist and warp. The housing must be designed such that opening or removing the panels provides access to the interior of the sign for lamp, ballast, and fuse replacement.

The top and bottom of the sign must be manufactured from formed or extruded aluminum and attached to formed or cast aluminum end fittings. The top, bottom, and end fittings must form a sealed housing.

For a Type A sign, both sides of the sign must be hinged at the top to allow installation or removal of the sign panel.

For a Type B sign, the sign panel must be slide mounted into the housing.

The top of the housing must have 2 free-swinging mounting brackets. Each bracket must be vertically adjustable for leveling the sign to either a straight or curved mast arm. The bracket assembly must allow the lighting fixture to swing perpendicular to the sign panel.

The reflectors must be formed aluminum and have an acrylic, baked-white-enamel surface with a minimum reflectance of 0.85.

Sign panel must be translucent, high-impact-resistant, and made of one of the following plastic materials:

1. Glass-fiber-reinforced, acrylated resin
2. Polycarbonate resin
3. Cellulose acetate butyrate

The sign panel must be designed not to crack or shatter if a 1-inch-diameter steel ball weighing 2.4 ounces is dropped from a height of 8.5 feet above the sign panel to any point on the panel. For this test, the sign panel must be lying in a horizontal position and supported within its frame.

The sign panel's surface must be evenly illuminated. The brightness measurements for the letters must be a minimum of 150 foot-lamberts, average. The letter-to-background brightness ratio must be from 10:1 to 20:1. The background luminance must not vary by more than 40 percent from the average background brightness measurement. The luminance of letters, symbols, and arrows must not vary by more than 20 percent from their average brightness measurement.

The sign panel's white or green color must not fade or darken if exposed to an accelerated test of UV light equivalent to 2 years of outdoor exposure.

The sign panel's legend, symbols, arrows, and border on each face must be white on a green background. The background must comply with color no. 14109 of FED-STD-595.

The message must appear on both sides of the sign and be protected from UV radiation. The letters must be 8-inch upper case and 6-inch lower case, series E.

A Type A sign must have a closed-cell, sponge-neoprene gasket installed between the sign panel frame to prevent the entry of water. The gasket must be uniform and even textured.

The sign ballast must be a high-power-factor type for outdoor operation from 110 to 125 V(ac) and 60 Hz and must comply with ANSI C82.1 and C82.2.

The ballast for a Type A sign must be rated at 200 mA. The ballast for a Type B sign must be rated at 430 mA.

Sign lampholder must:

1. Be the spring-loaded type
2. Have silver-coated contacts and waterproofed entrance leads
3. Have a heat-resistant, circular cross section with a partially recessed neoprene ring

Removal of the lamp from the socket must de-energize the primary of the ballast.

The springs for the lampholders must not be a part of the current-carrying circuit.

The sign's wiring connections must terminate on a molded, phenolic, barrier-type, terminal block rated at 15 A, 1,000 V(ac). The connections must have a white, integral, waterproof marking strip. The terminal screws must not be smaller than a no. 10.

The terminal block must be insulated from the fixture to provide protection from the line-to-ground flashover voltage.

A sectionalized terminal block must have an integral barrier on each side and must allow rigid mounting and alignment.

Fixture's conductors must:

1. Be stranded copper wire with a minimum thermoplastic insulation of 28 mils

2. Be rated at 1,000 V(ac) and for use up to 90 degrees C
3. Be a minimum of no. 16
4. Match the color coding of the ballast leads
5. Be secured with spring cross straps, installed 12 inches apart or less in the chassis or fixture

Stranded copper conductors connected to screw-type terminals must terminate in crimp-type ring connectors.

No splicing is allowed within the fixture.

The sign's fuse must be the Type 3AG, miniature, slow-blow type.

The fuse holder must be a panel-mounting type with a threaded or bayonet knob that grips the fuse tightly for extraction. Each ballast must have a separate fuse.

87-4.03 CONSTRUCTION

87-4.03A General

Set the foundations for standards such that the mast arm is perpendicular to the centerline of the roadway.

Tighten the cap screws of the luminaire's clamping bracket to 10 ft-lb for LED and low-pressure luminaires.

Label the month and year of the installation inside the luminaire housing's door.

Perform the conductor and operational tests for the system.

87-4.03B Battery Backup System Cabinets

Install the battery backup system cabinet to the right of the Model 332L cabinet.

If installation on the right side is not feasible, obtain authorization for installation on the left side.

Provide access for power conductors between the cabinets using:

1. 2" nylon-insulated, steel chase nipple
2. 2" steel sealing locknut
3. 2" nylon-insulated, steel bushing

Remove the jumper between the terminals labeled *BBS-1* and *BBS-2* in the 5 position terminal block in the controller cabinet before connecting the Department-furnished electronics assembly.

87-4.03C Internally Illuminated Street Name Signs

Mount the internally illuminated street name sign to the signal mast arm using the adjustable brackets. Connect the conductors to the terminal blocks in the signal head mounting terminal block.

87-4.04 PAYMENT

Not Used

87-5 RAMP METERING SYSTEMS

87-5.01 GENERAL

Section 87-5 includes specifications for constructing ramp metering systems.

Ramp metering system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Standards
6. Signal heads
7. Service equipment enclosure
8. Department-furnished controller assembly

9. Detectors
10. Telephone demarcation cabinet

The components of a ramp metering system are shown on the project plans.

87-5.02 MATERIALS

Not Used

87-5.03 CONSTRUCTION

Connect the field wiring to the terminal blocks in the controller cabinet. The Engineer provides you a list of field conductor terminations for each controller cabinet.

Perform the conductor and operational tests for the system.

87-5.04 PAYMENT

Not Used

87-6 TRAFFIC MONITORING STATION SYSTEMS

87-6.01 GENERAL

Section 87-6 includes specifications for constructing traffic monitoring station systems.

Traffic monitoring station system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Cables
5. Conductors
6. Service equipment enclosure
7. Controller cabinet
8. Detectors
9. Telephone demarcation cabinet

The components of a traffic monitoring station system are shown on the project plans.

87-6.02 MATERIALS

Not Used

87-6.03 CONSTRUCTION

Connect the field wiring to the terminal blocks in the controller cabinet. The Engineer provides you a list of field conductor terminations for the controller cabinet.

Perform the conductor and operational tests for the system.

87-6.04 PAYMENT

Not Used

87-7 FLASHING BEACON SYSTEMS

87-7.01 GENERAL

Section 87-7 includes specifications for constructing flashing beacon systems.

Flashing beacon system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Standards
6. Service equipment enclosure
7. Signal heads
8. Flashing beacon control assembly

The components of a flashing beacon system are shown on the project plans.

The flash rate for the flashing beacon must comply with chapter 4L, "Flashing Beacons," of the *California MUTCD*.

The flashing beacon must allow alternating flashing wig-wag operation.

The flashing beacon must have a separate flasher unit installed in the flashing beacon control assembly.

87-7.02 MATERIALS

Flashing beacon control assembly must:

1. Have a NEMA 3R enclosure with a dead front panel and a hasp with a 7/16-inch hole for a padlock. The enclosure must have one of the following finishes:
   1.1. Powder coating.
   1.2. Hot-dip galvanized coating.
   1.3. Factory-applied, rust-resistant prime coat and finish coat.
2. Have barrier-type terminal blocks rated for 25 A, 600 V(ac), made of molded phenolic or nylon material and have plated-brass screw terminals and integral marking strips.
3. Include a solid state flasher complying with section 8 of NEMA standards publication no. TS 1 for 10 A, dual circuits.

87-7.03 CONSTRUCTION

Perform the conductor and operational tests for the system.

87-7.04 PAYMENT

Not Used

87-8–87-11 RESERVED

87-12 CHANGEABLE MESSAGE SIGN SYSTEMS

87-12.01 GENERAL

Section 87-12 includes specifications for constructing changeable message sign systems.

Changeable message sign system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Service equipment enclosure
6. Department-furnished controller cabinet
7. Department-furnished changeable message sign
8. Department-furnished wiring harness
9. Service equipment enclosure
10. Sign disconnect

The components of a changeable message sign system are shown on the project plans.

87-12.02 MATERIALS

Not Used

87-12.03 CONSTRUCTION

Install the changeable message sign.

Connect the field wiring to the terminal blocks in the sign assembly and controller cabinet.

The Engineer provides you a list of field conductor terminations for each sign cabinet and controller cabinet.

The Department maintains the sign assemblies.

87-12.04 PAYMENT

Not Used

87-13–87-17 RESERVED

87-18 INTERCONNECTION CONDUIT AND CABLE

87-18.01 GENERAL

Section 87-18 includes specifications for constructing interconnection conduit and cable.

Interconnection conduit and cable includes:

1. Pull boxes
2. Conduit
3. Signal interconnect cables

The components of an interconnection conduit and cable are shown.

87-18.02 MATERIALS

Not Used

87-18.03 CONSTRUCTION

Test the signal interconnect cable.

Connect the signal interconnect cable to the terminal block in the controller cabinets. The Engineer provides you a list of terminations for each controller cabinet.

87-18.04 PAYMENT

Not Used

87-19 RESERVED

87-20 TEMPORARY ELECTRICAL SYSTEMS

87-20.01 GENERAL

Section 87-20 includes specifications for providing temporary electrical systems.

Obtain the Department's authorization for the type of temporary electrical system and its installation method.

A temporary system must operate on a continuous, 24-hour basis.

87-20.02 MATERIALS

87-20.02A General

Material and equipment may be new or used.

The components of a temporary system are shown on the project plans.

If you use Type UF-B cable, the minimum conductor size must be no. 12.

87-20.02B Temporary Flashing Beacon Systems

A temporary flashing beacon system consists of a flashing beacon system, wood post, generator, and photovoltaic system.

The system must comply with the specifications for a flashing beacon system in section 87-7, except it may be mounted on a wood post or a trailer.

87-20.02C Temporary Lighting Systems

A temporary lighting system consists of a lighting system, generator, and wood poles.

The system must comply with the specifications for a lighting system in section 87-2, except it may be mounted on a wood pole or a trailer.

87-20.02D Temporary Signal Systems

A temporary signal system consists of a signal and lighting system, wood poles and posts, and a generator.

System must comply with the specifications for a signal and lighting system in section 87-4, except:

1. Signal heads may be mounted on a wood pole, mast arm, tether wire, or a trailer
2. Flashing beacons may be mounted on a wood post, or a trailer

87-20.03 CONSTRUCTION

87-20.03A General

Provide electrical and telecommunication services for temporary systems. Do not use existing services unless authorized.

Provide power for the temporary electrical systems under section 12-3.33, except you may use a photovoltaic system for the temporary flashing beacon system.

Install conductors and cables in a conduit, suspended from wood poles at least 25 feet above the roadway, or use direct burial conductors and cables.

You may saw slots across paved areas for burial conductors and cables.

Install conduit outside the paved area at a minimum of 12 inches below grade for Type 1 and 2 conduit and at a minimum of 18 inches below grade for Type 3 conduit.

Install direct burial conductors and cables outside the paved area at a minimum depth of 24 inches below grade.

Place the portions of the conductors installed on the face of wood poles in either Type 1, 2, or 3 conduit between the point 10 feet above grade at the pole and the pull box. The conduit between the pole and the pull box must be buried at a depth of at least 18 inches below grade.

Place conductors across structures in a Type 1, 2, or 3 conduit. Attach the conduit to the outside face of the railing.

Mount the photoelectric unit at the top of the standard or wood post.

You may abandon in place conductors and cables in sawed slots or in conduit installed below the ground surface.

87-20.03B Temporary Flashing Beacon Systems

Install a fused-splice connector in the pull box adjacent to each flashing beacon. Wherever conductors are run overhead, install the splice connector in the line side outside of the control assembly.

87-20.03C Temporary Lighting Systems

Wherever conductors are run overhead, install the fuse splice connectors in the line side before entering the mast arm.

87-20.03D Temporary Signal Systems

You may splice conductors that run to a terminal compartment or a signal head on a pole to the through conductors of the same phase in a pull box adjacent to the pole. Do not splice conductors or cables except in a pull box or in a NEMA 3R enclosure.

The Department provides the timing for the temporary signal.

Maintain the temporary signal except for the Department-furnished controller assembly.

87-20.04 PAYMENT

Not Used

87-21 EXISTING ELECTRICAL SYSTEMS

87-21.01 GENERAL

Section 87-21 includes general specifications for performing work on existing electrical systems.

87-21.02 MATERIALS

Not Used

87-21.03 CONSTRUCTION

87-21.03A General

You may abandon unused underground conduit after pulling out all conductors and removing conduit terminations from the pull boxes.

If standards are to be salvaged, remove:

1. All components
2. Mast arms from the standards
3. Luminaires, signal heads, and signal mounting assemblies from the standards and mast arms

If the existing material is unsatisfactory for reuse and the Engineer orders you to replace it with new material, replacing the existing material with new material is change order work.

If the removed electrical equipment is to be reinstalled, supply all materials and equipment, including signal mounting assemblies, anchor bolts, nuts, washers, and concrete, needed to complete the new installation.

87-21.03B Maintaining Existing Electrical Systems

87-21.03B(1) General

Maintain the existing electrical system in working order during the progress of the work. Conduct your operations to avoid damage to the elements of the systems.

87-21.03B(2) Maintaining Existing Traffic Management System Elements During Construction

Section 87-21.02B(2) applies if a bid item for maintaining existing traffic management system elements during construction is shown on the Bid Item List.

Traffic management system elements include:

1. Ramp metering system
2. Traffic monitoring stations
3. Microwave vehicle detection system
4. Changeable message sign system
5. Extinguishable message sign system
6. Highway advisory radio system
7. Closed circuit television camera system
8. Roadway weather information system

Obtain authorization at least 72 hours before interrupting communication between an existing system and the traffic management center.

If the Engineer notifies you that an existing system is not fully operational due to your activities, repair or replace the system within 72 hours. If the system cannot be fixed within 72 hours or it is located on a structure, provide a temporary system within 24 hours until the system can be fixed. Perform a functional test of the system in the presence of the Engineer. If you fail to perform the necessary repair or replacement work, the Department may perform the repair or replacement work and deduct the cost.

If you damage an existing fiber optic cable, install a new cable such that the length of cable slack is the same as before the damage, measured from an original splice point or termination. All splices must be made using the fusion method.

You may interrupt the operation of traffic monitoring stations:

1. For 60 days if another operational traffic monitoring station is located within 3 miles

2. For 15 days if another operational traffic monitoring station is located more than 3 miles away

If a traffic monitoring station must be interrupted for longer periods than specified, provide a temporary detection system. Obtain the Department's authorization for the type of temporary system and its installation method.

87-21.03C Modifying Existing Electrical Systems

Modify electrical systems as shown.

87-21.03D Removing Existing Electrical Systems

The components to be removed are shown on the project plans.

87-21.04 PAYMENT

Not Used

^^

DIVISION XI MATERIALS

90 CONCRETE

07-15-16

Replace *Method 1* in the 4th paragraph of section 90-1.01D(5)(a) with:

07-15-16

Method 2

Replace section 90-9 with:

07-15-16

90-9 RETURNED PLASTIC CONCRETE

90-9.01 GENERAL

90-9.01A Summary

Section 90-9 includes specifications for incorporating returned plastic concrete (RPC) into concrete.

RPC must be used only where the specifications allow its use. Do not use RPC in pavement or structural concrete.

90-9.01B Definitions

returned plastic concrete (RPC): Excess concrete that is returned to a concrete plant in a plastic state and that has not attained initial set.

hydration stabilizing admixture (HSA): Extended set retarding admixture that controls and predictably reduces the hydration rate of the cementitious material.

90-9.01C Submittals

Submit the following with the weighmaster certificate:

1. Weight or volume of RPC
2. Type, brand, and dosage of HSA
3. Time of adding HSA
4. Copy of the original weighmaster certificate for the RPC
5. Temperature of RPC

When requested, submit the HSA manufacturer's instructions, including dosage tables.

90-9.01D Quality Assurance

The material plant producing concrete containing RPC must be authorized under the MPQP.

For volumetric proportioning of RPC:

1. The volumetric container must be imprinted with manufacturer's name, model number, serial number, the as-calibrated volume and date of the last calibration. Cross sectional dimensions of the container must remain the same as those during its calibration.
2. The device must be re-calibrated monthly and at any time when the container shape has been deformed from its original condition or there is evidence of material build-up on the inside of the device.
3. The device must be held in a level condition during filling. Fill the device to the measure or strike-off line. Each measurement must be filled to within 1.0% of the device as-calibrated volume.
4. The device interior must be cleaned after each measurement to maintain a zero condition.

For weight proportioning, proportion RPC with a weigh hopper attached to the plant at a position which allows the addition of the RPC to the mixer truck with the conventional PCC ingredients. The plant process controller must control the proportioning of RPC to within 1.0% of its target weight.

90-9.02 MATERIALS

90-9.02A General

The quantity of RPC added to the concrete must not exceed 15 percent.

The cementitious material content of the RPC must be at least that specified for the concrete that allows the use of RPC.

Water must not be added to the RPC after batching, including in the truck mixer.

Use HSA for controlling and reducing the hydration rate of RPC.

Incorporate RPC by mixing into the concrete before arriving at the jobsite.

90-9.02B Returned Plastic Concrete

The RPC must not exceed 100 degrees F at any time.

If HSA is not used, RPC must be incorporated into the concrete before attaining initial set or within 4 hours after batching of RPC, whichever is earlier.

If HSA is used:

1. Add HSA to RPC within 4 hours after original batching.
2. Measure and record the time, dosage of HSA, and temperature of RPC when HSA is added.
3. Mix the RPC under the HSA manufacturer's instructions after adding HSA or at least 30 revolutions, whichever is greater.
4. Incorporate RPC into the concrete within 4 hours after adding HSA.

RPC must not contain:

1. Accelerating admixture
2. Fiber
3. Pigment
4. Lightweight aggregate
5. Previously returned RPC
6. Any ingredient incompatible with the resultant concrete

90-9.02C Hydration Stabilizing Admixture

HSA must comply with ASTM C494 admixture Type B or Type D.

HSA must have a proven history of specifically maintaining and extending both plasticity and set.

HSA dosage must comply with the manufacturer's instructions.

90-9.02D Production

Proportion concrete containing RPC under section 90-2.02E.

Proportion RPC by weight or by volume.

90-9.03 CONSTRUCTION

Not Used

90-9.04 PAYMENT

Not Used

^^

92 ASPHALT BINDERS

04-15-16

04-15-16

Replace the 4th paragraph of section 92-1.02B with:

Crumb rubber modifier used must be on the Authorized Materials List for crumb rubber modifier.

Production equipment for PG modified asphalt binder with crumb rubber modifier must be authorized under the Department's *MPQP*.

Crumb rubber must be derived from waste tires described in Pub Res Code § 42703 and must be free from contaminants including fabric, metal, minerals, and other nonrubber substances.

^^

96 GEOSYNTHETICS

01-15-16

Replace *product name, manufacturing source, and date of manufacture* in the 2nd sentence of the 1st paragraph of section 96-1.01D with:

01-15-16

manufacturing source code

BID BOOK

AMERICAN AVENUE DISPOSAL SITE PHASE III – MODULES 9 & 10 EXCAVATION AND LINER CONSTRUCTION

18950 W AMERICAN AVE, KERMAN, CA 93630

BUDGET / ACCOUNT: 9026 / 8150

Department of Public Works and Planning

CONTRACT NUMBER 23-24-SW

BID BOOK TABLE OF CONTENTS

AMERICAN AVENUE DISPOSAL SITE PHASE III – MODULES 9 & 10 EXCAVATION AND LINER CONSTRUCTION
CONTRACT NUMBER 23-24-SW

INSTRUCTIONS FOR COMPLETING THE BID BOOK FOR NON-FEDERAL AID PROJECTS

General

Complete forms in the *Bid* book.

Submit an electronic bid online at http://www.BidExpress.com (Section 2-1.33D) or submit a hardcopy bid:

1. Under sealed cover addressed to the Department and labeled with the name of the bidder, the name of the project and the statement 'Do Not Open Until The Time Of Bid Opening.'
2. Marked as a bid
3. Identifying the contract number and the bid opening date

Certain bid forms must be submitted with the bid and properly executed.

Certain other forms and information must be submitted either with the bid or within the prescribed period after bid opening as specified elsewhere in these special provisions.

Failure to submit the forms and information as specified results in a nonresponsive bid.

If an agent other than the authorized corporation officer or a partnership member signs the bid, file a Power of Attorney with the Department either before opening bids or with the bid. Otherwise, the bid may be nonresponsive.

Bid Item List and Bid Comparison

Submit a bid based on the bid item quantities the Department shows on the Bid Item List. Bids will be evaluated and the low bidder determined as indicated in the *Notice to Bidders.*

Bid Document Completion

Proposal items are identified by title and by the word “Proposal” followed by the number assigned to the proposal item in question. Proposal items are included in the *Bid Book.*

Proposal to the Board of Supervisors of Fresno County – Proposal 1

Provided for information.

Bid Item List – Proposal 2

One or more sheet(s) or list(s) upon which the bidder completes the bid.

Fill out completely including a unit price and total for each unit price-based item and a total for each lump sum item.

Do not make any additions such as “plus tax”, “plus freight”, or conditions such as “less 2% if paid by 15th”.

Use ink or typewriter for paper bids.

Evaluation of Bid Item List – Proposal 3

Describes how inconsistences and irregularities are evaluated and corrected when Design Services reviews the Bid Item List.

Bid Security and Signature – Proposal 4

Submit one of the following forms of bidder's security equal to at least 10 percent of the bid:

- Cash
- Cashier's check
- Certified check

- Signed bidder's bond by an admitted surety insurer

Indicate type of bid security provided.

- Cash – Acceptable but not recommended. Cash is deposited in a clearing account and is returned to bidders by County warrant. This process may take several weeks.
- Cashier's or Certified Checks. This type of security is held until the bid is no longer under consideration. If submitted by a potential awardee, they will be returned when the contract is fully executed by the bidder and bonds and insurance have been approved.
- Bid Bonds - Must be signed by the bidder and by the attorney-in-fact for the bonding company. Provide notarized signature of attorney-in-fact accompanied by bonding company's affidavit authorizing attorney-in-fact to execute bonds. An unsigned bid bond will be cause for rejection.

Bonding companies may provide their own bid bond forms. Proposal 4 must be completed by the bidder and submitted with their bid.

Acknowledge Addenda

Provide contractor's license information.

State business name and if business is a:

- Corporation - list officers
- Partnership - list partners
- Joint Venture - list members; if members are corporations or partnerships, list their officers or partners.
- Individual - list Owner's name and firm name style

Signature of Bidder - the following lists types of companies and corresponding authorized signers.

- Corporation - by an officer
- Partnership - by a partner
- Joint Venture - by a member
- Individual - by the Owner

If signature is by a Branch Manager, Estimator, Agent, etc., the bid must be accompanied by a power of attorney authorizing the individual to sign the bid in question or to sign bids more generally, otherwise the bid may be rejected.

- Business Address - Firm's Street Address
- Mailing Address - P.O. Box or Street Address
- Complete, sign, and return with bid.

Noncollusion Declaration – Proposal 5

Must be completed, signed, and returned with bid.

Public Contract Code Section 10285.1 Statement – Proposal 6

Select "has" or "has not" in accordance with instructions on form, return completed form with bid. Note that signing the bid constitutes signing this statement.

Public Contract Code Section 10162 Questionnaire And Public Contract Code 10232 Statement – Proposal 7

Select "yes" or "no" accordance with instructions on form, include explanation if "yes" is selected. Return completed form with bid. Note that signing the bid constitutes signing this questionnaire and statement.

Subcontractors – Proposal 8

Sheet(s) or spaces where bidders list subcontractors. List each subcontractor to perform work in an amount in excess of 1/2 of 1 percent of the total bid (Pub Cont Code § 4100 et seq.).

The *Subcontractor List* submitted with the bid must show the name, location of business, work portions to be performed, the contractor's license number and the public works contractor registration number issued pursuant to Labor Code Section 1725.5, for each listed subcontractor.

- Use subcontractor's business name style as registered with the License Board.
- Specify the city in which the subcontractor's business is located and the state if other than California.
- Description of the work to be performed by the subcontractor. Indicate with bid item numbers from the bid item list and/or work descriptions similar to those on bid item list.
- List license number for each subcontractor.

Upon request from Design Services, provide the following additional information within 24 hours of bid opening if not included on the *Subcontractor List* submitted with the bid:

- Complete physical address for each subcontractor listed.
- Percentage of the total bid or dollar amount associated with each subcontractor listed.
- Department of Industrial Relations registration number.

Proposal 9 - 16 – Not Used

Guaranty - Proposal 17

This document may, but does not need to be, submitted with the bid. It is part of the contract documents and must be separately signed and submitted by the contractor to whom the award is made, together with the executed Agreement.

Title 13, California Code of Regulations § 2449(i) General Requirements for In-Use Off-Road Diesel-Fueled Fleets – Proposal 18

Contractors, if applicable, must submit valid Certificates of Reported Compliance with their bid. Subcontractor certificates will be due no later than 4:00 PM on the fifth (5^{th}) calendar day after the bid opening if not submitted with the bid.

PROPOSAL TO THE COUNTY OF FRESNO

_____

hereinafter called the Owner

AMERICAN AVENUE DISPOSAL SITE PHASE III – MODULES 9 & 10 EXCAVATION AND LINER CONSTRUCTION

18950 W AMERICAN AVE, KERMAN, CA 93630

The work embraced herein shall be done in accordance with the 2015 Standard Specifications and with the 2015 Standard Plans, of the State of California, Department of Transportation insofar as the same may apply and in accordance with these special provisions.

Except to the extent that they may conflict with these special provisions, revised Standard Specifications apply to the extent included in the section entitled “Project Details” of the book entitled “Specifications.”

The work to be done is shown on a set of Plans, Department File No. 11327, entitled: “American Avenue Disposal Site Phase III Modules 9 & 10 Excavation and Liner Construction ”

The undersigned, as bidder, declares that the only persons, or parties interested in this proposal as principals are those named herein, that this proposal is made without collusion with any other person, firm or corporation; that they have carefully examined the location of the proposed work, the annexed proposed form of contract, and the plans therein referred to; and they propose and agrees if this proposal is accepted, that they will contract with the Owner to provide all necessary machinery, tools, apparatus and other means of construction, and to do all the work and furnish all the materials specified in the contract in the manner and time therein prescribed, and according to the requirements of the Engineer as therein set forth, and that they will take in full payment therefor the following unit prices, to-wit:

Fresno County Department of Public Works and Planning

Bid Item List - Proposal 2

Contract # 23-24-SW

AMERICAN AVENUE DISPOSAL SITE PHASE III – MODULES 9 & 10

18950 W AMERICAN AVE, KERMAN, CA 93630

Bid Items

Item ID Description	Quantity	Unit	Unit Price	Total
1 SUPPLEMENTAL WORK ALLOWANCE	350,000	$	$1	$350,000
2 SUPPLEMENTAL WORK (SPECIAL STOCKPILING)	20,000	$	$1	$20,000
3 SUPPLEMENTAL WORK (SPECIAL TRAFFIC HANDLING AND OPERATIONS)	70,000	$	$1	$70,000
4 JOB SITE MANAGEMENT	1	LS	$	$
5 PREPARE AND IMPLEMENT STORM WATER POLLUTION PREVENTION PLAN	1	LS	$	$
6 HEALTH AND SAFETY	1	LS	$	$
7 CONSTRUCTION SURVEY	1	LS	$	$
8 TRAFFIC CONTROL SYSTEM	1	LS	$	$
9 CLEARING AND GRUBBING	1	LS	$	$

10	17,121	SY	$	$
UNSUITABLE MATERIAL				
11	269,000	CY	$	$
MODULE EXCAVATION - Final Pay Item				
12	153,311	SY	$	$
MODULE 9 & 10 SUBGRADE PREPARATION - Final Pay Item				
13	1	LS	$	$
FINISH PROJECT SITE				
14	1,900	LF	$	$
PERFORATED HDPE PIPE, 6"				
15	136	LF	$	$
PERFORATED HDPE PIPE, 10"				
16	963	LF	$	$
NON-PERFORATED HDPE PIPE, 6"				
17	1,000	LF	$	$
NON-PERFORATED HDPE PIPE, 10"				
18	1,438,000	SF	$	$
GEOSYNTHETIC CLAY LINER - Final Pay Item				
19	1,448,000	SF	$	$
HDPE GEOMEMBRANE - Final Pay Item				
20	1,406,000	SF	$	$
GEOCOMPOSITE - Final Pay Item				
21	7,300	SF	$	$
GEOTEXTILE (10 OZ) - Final Pay Item				
22	150	EA	$	$
PROTECTIVE PLYWOOD COVER				
23	104,000	CY	$	$
OPERATIONS LAYER - Final Pay Item				
24	1	LS	$	$
LEACHATE & LYSIMETER METER, METERING PIPE & FITTINGS				
25	1	LS	$	$
LEACHATE & LYSIMETER PUMPS				
26	24	EA	$	$
STEEL PIPE BOLLARD				

27	6	CY	$	$
CLASS 3 CONCRETE (SLAB) - Final Pay Item				
28	1	LS	$	$
FURNISH AND INSTALL SUMP CONTROL PANEL, PANEL BACKBOARD AND HARDWARE				
29	1,600	CY	$	$
PERMEABLE MATERIAL - Final Pay Item				
30	1	LS	$	$
GEOELECTRIC LEAK DETECTION SURVEY SUPPORT				
31	10,541	CY	$	$
CUSTOMER ACCESS & SCRAPER ACCESS ROADS EMBANKMENT - Final Pay Item				
32	5,132	CY	$	$
CUSTOMER ACCESS & SCRAPER ACCESS ROAD EXCAVATION - Final Pay Item				
33	9,437	CY	$	$
WINTER PAD EMBANKMENT - Final Pay Item				
34	4,000	CY	$	$
CLASS 2 AGGREGATE BASE (INCL. WINTER PAD) - Final Pay Item				
35	160	LF	$	$
INSTALLATION OF 12" DIA. HDPE CULVERT				
36	2	EA	$	$
TRAFFIC SIGN				
37	85	EA	$	$
CLASS I FLEXIBLE POST DELINEATORS - TYPE E				
38	3,350	LF	$	$
8" DIAMETER STRAW WATTLES				
39	370	LF	$	$
20" DIAMETER STRAW WATTLES				
40	1	LS	$	$
MOBILIZATION				

Bid Items Total: $

EVALUATION OF BID PROPOSAL ITEM LIST

Abbreviations used in the bid proposal sheet are identified in Section 1-1.06, “Abbreviations,” of these special provisions.

Bids are required for the entire work. Bids will be compared on the basis indicated in the Notice to Bidders. The bidder shall set forth for each unit basis item of work a unit price and a total for the item, and for each lump sum item a total for the item, all in clearly legible figures in the respective spaces provided for that purpose. In the case of unit basis items, the amount set forth under the "Item Total" column shall be the product of the unit price bid and the estimated quantity for the item.

In case of discrepancy between the unit price and the total set forth for a unit basis item, the unit price shall prevail, except as provided in (a) or (b), as follows:

(a) If the amount set forth as a unit price is unreadable or otherwise unclear, or is omitted, or is the same as the amount as the entry in the item total column, then the amount set forth in the item total column for the item shall prevail and shall be divided by the estimated quantity for the item and the price thus obtained shall be the unit price;

(b) (Decimal Errors) If the product of the entered unit price and the estimated quantity is exactly off by a factor of ten, one hundred, etc., or one-tenth, or one-hundredth, etc. from the entered total, the discrepancy will be resolved by using the entered unit price or item total, whichever most closely approximates percentage-wise the unit price or item total in the Owner's Final Estimate of cost.

If both the unit price and the item total are unreadable or otherwise unclear, or are omitted, the bid may be deemed irregular. Likewise, if the item total for a lump sum item is unreadable or otherwise unclear, or is omitted, the bid may be deemed irregular unless the project being bid has only a single item and a clear, readable total bid is provided.

Symbols such as commas and dollar signs will be ignored and have no mathematical significance in establishing any unit price or item total or lump sums. Written unit prices, item totals and lump sums will be interpreted according to the number of digits and, if applicable, decimal placement. Cents symbols also have no significance in establishing any unit price or item total since all figures are assumed to be expressed in dollars and/or decimal fractions of a dollar. Bids on lump sum items shall be item totals only; if any unit price for a lump sum item is included in a bid and it differs from the item total, the items total shall prevail.

The foregoing provisions for the resolution of specific irregularities cannot be so comprehensive as to cover every omission, inconsistency, error or other irregularity which may occur in a bid. Any situation not specifically provided for will be determined in the discretion of the Owner, and that discretion will be exercised in the manner deemed by the Owner to best protect the public interest in the prompt and economical completion of the work. The decision of the Owner respecting the amount of a bid, or the existence or treatment of an irregularity in a bid, shall be final.

If this proposal shall be accepted and the undersigned shall fail to contract, as aforesaid, and to give the two bonds in the sums to be determined as aforesaid, with surety satisfactory to the Owner, within eight (8) days not including Saturdays, Sundays and legal holidays, after the bidder has received notice of award of the contract, the Owner, at its option, may determine that the bidder has abandoned the contract, and thereupon this proposal and the acceptance thereof shall be null and void, and the forfeiture of such security accompanying this proposal shall operate and the same shall be the property of the Owner.

Bid Security

Accompanying this proposal is security (check one only) in amount equal to at least ten percent (10%) of the total amount of the bid:

Bid Bond ( ); Certified Check ( ); Cashier's Check ( ); Cash ($)

Addenda Acknowledgement

Bidder has and acknowledges the following addenda: _____

Bidder Signature

Business Name _____

Note: If bidder or other interested person is a corporation, state legal *name of corporation. If bidder is a co-partnership, state* true *name of firm.*

Business Owners and Officers Names _____
Note: If bidder or other interested person is:

- *a corporation, list names of the president, secretary, treasurer and manager thereof*
- *a partnership, list names of all individual co-partners composing firm.*
- *an individual, state first and last name in full.*

Names of Owners and Key Employees _____

Note: List majority owners of your firm. If multiple owners, list all. Also include anyone, including key employees, who are actively promoting the contract. (SB1439)

Licensed in accordance with an act providing for the registration of Contractors:

Class _____ Contractor License No. _____ Expires _____

DIR Registration Number _____

Business Address: _____
Zip Code

Mailing Address: _____
Zip Code

Business Phone: (_____)_____ Fax Number: (_____)_____

Email Address _____

Signature of Bidder: _____ Dated: _____

NOTE: If bidder is a corporation, the legal name of the corporation shall be set forth above together with the signature of the officer or officers authorized to sign contracts on behalf of the corporation; if bidder is a co-partnership, the true name of the firm shall be set forth above together with the signature of the partner or partners authorized to sign contracts on behalf of the co-partnership; and if bidder is an individual, his or her signature shall be placed above. If signature is by an agent, other than an officer of a corporation or a member of a partnership, a Power of Attorney must be on file with the Owner prior to opening bids or submitted with the bid; otherwise, the bid will be disregarded as irregular and unauthorized.

To the County of Fresno:

NONCOLLUSION DECLARATION

TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID*

The undersigned declares:

I am the _____ of
(Owner, Partner, Corporate Officer (list title), Co-Venturer)

_____, the party making the foregoing bid.

The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or refrain from bidding. The bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder. All statements contained in the bid are true. The bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, and has not paid, and will not pay, any person or entity for that purpose.

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____, 2024,

at _____, _____."
[city] [state]

_____
(Signature)

(See Title 23 United States Code Section 112; Calif Public Contract Code Section 7106)

*NOTE: Completing, signing, and returning the Non-Collusion Declaration is a required part of the Proposal. Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

PUBLIC CONTRACT CODE

Public Contract Code Section 10285.1 Statement

In conformance with Public Contract Code Section 10285.1 (Chapter 376, Stats. 1985), the bidder hereby declares under penalty of perjury under the laws of the State of California that the 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 "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 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 Bid. Signing this Bid on the signature portion thereof shall also constitute signature of this Statement. Bidders are cautioned that making a false certification may subject the certifier to criminal prosecution.

Public Contract Code Section 10162 Questionnaire

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

Has the bidder, any officer of the bidder, or any employee of the bidder who has a proprietary interest in the bidder, ever been disqualified, removed, or otherwise prevented from 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.

Public Contract Code 10232 Statement

In conformance with Public Contract Code Section 10232, the Contractor, hereby states under penalty of perjury, that no more than one final unappealable 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 Bid. Signing this Bid on the signature portion thereof shall also constitute signature of this Statement and Questionnaire.

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

BIDDER: _____

SUBCONTRACTORS:

The following named subcontractor(s) will perform with labor, or otherwise render services to the general contractor in or about the construction of the work or improvement in an amount in excess of one-half of one percent of the total bid presented herewith **or $10,000, whichever is greater.** Each listed subcontractor's name, location of business and description of work, and both their contractor's license number and public works contractor registration number, issued pursuant to Section 1725.5 of the Labor Code, are REQUIRED, by Section 4104 of the California Public Contract Code, to be submitted prior to bid opening. (The "location of business" must specify the city in which the subcontractor's business is located, and the state if other than California.) All other requested information shall be submitted, either with the bid or within 24 hours after bid opening.

Please fill out as completely as possible when submitting your bid. Use subcontractor's business name style as registered with the License Board.

FAILURE TO LIST SUBCONTRACTORS AS DIRECTED MAY RENDER THE BID NON-RESPONSIVE, OR MAY RESULT IN ASSESSMENT OF A PENALTY AGAINST THE BIDDER IN ACCORDANCE WITH SECTION 4110 OF THE CALIFORNIA PUBLIC CONTRACT CODE.

SUBCONTRACTOR: _____

Business Address: _____

Class ____ License No._____ DIR Registration No. _____

Item No. or Description of Work: _____

Dollar Amount _____ **OR** Percentage of Total Bid _____

Email Address: _____

SUBCONTRACTOR: _____

Business Address: _____

Class ____ License No._____ DIR Registration No _____

Item No. or Description of Work: _____

Dollar Amount _____ **OR** Percentage of Total Bid _____

Email Address: _____

SUBCONTRACTOR: _____

Business Address: _____

Class ____ License No._____ DIR Registration No _____

Item No. or Description of Work: _____

Dollar Amount _____ **OR** Percentage of Total Bid _____

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SUBCONTRACTOR: _____

Business Address: _____

Class ____ License No._____ DIR Registration No. _____

Item No. or Description of Work: _____

Dollar Amount _____ **OR** Percentage of Total Bid _____

Email Address: _____

SUBCONTRACTOR: _____

Business Address: _____

Class ____ License No._____ DIR Registration No _____

Item No. or Description of Work: _____

Dollar Amount _____ **OR** Percentage of Total Bid _____

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SUBCONTRACTOR: _____

Business Address: _____

Class ____ License No._____ DIR Registration No. _____

Item No. or Description of Work: _____

Dollar Amount _____ **OR** Percentage of Total Bid _____

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SUBCONTRACTOR: _____

Business Address: _____

Class ____ License No._____ DIR Registration No _____

Item No. or Description of Work: _____

Dollar Amount _____ **OR** Percentage of Total Bid _____

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Business Address: _____

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Email Address: _____

SUBCONTRACTOR: _____

Business Address: _____

Class ____ License No._____ DIR Registration No. _____

Item No. or Description of Work: _____

Dollar Amount _____ **OR** Percentage of Total Bid _____

Email Address: _____

(This guaranty shall be executed by the successful bidder in accordance with instructions in the special provisions. The bidder may execute the guaranty on this page at the time of submitting his bid.)

G U A R A N T Y

To the Owner: County of Fresno

CONTRACT NUMBER 23-24-SW

The undersigned guarantees the construction and installation of the following work included in this project:

ALL WORK

Should any of the materials or equipment prove defective or should the work as a whole prove defective, due to faulty workmanship, material furnished or methods of installation, or should the work or any part thereof fail to operate properly as originally intended and in accordance with the plans and specifications, due to any of the above causes, all within twelve (12) months after date on which this contract is accepted by the Owner, the undersigned agrees to reimburse the Owner, upon demand, for its expenses incurred in restoring said work to the condition contemplated in said project, including the cost of any such equipment or materials replaced and the cost of removing and replacing any other work necessary to make such replacement or repairs, or, upon demand by the Owner, to replace any such material and to repair said work completely without cost to the Owner so that said work will function successfully as originally contemplated.

The Owner shall have the unqualified option to make any needed replacement or repairs itself or to have such replacements or repairs done by the undersigned. In the event the Owner elects to have said work performed by the undersigned, the undersigned agrees that the repairs shall be made and such materials as are necessary shall be furnished and installed within a reasonable time after the receipt of demand from the Owner.

Name (Printed): _____

Signature: _____

Title: _____

Date: _____ Contractor: _____

TITLE 13, CALIFORNIA CODE OF REGULATIONS § 2449(I) GENERAL REQUIREMENTS FOR IN-USE OFF-ROAD DIESEL-FUELED FLEETS

In conformance with Title 13 § 2449(i), bidders will be required to attach copies of valid Certificates of Reported Compliance for the fleet selected for the contract and their listed subcontractors.

Before May 15th of each year, the prime contractor must collect a new valid Certificate of Reported Compliance for the current compliance year, as defined in section 2449(n), from all fleets that have an ongoing contract with the prime contractor as of March 1 of that year. Prime contractors must not write contracts to evade this requirement. Annual renewals must be provided to the Resident Engineer at least one week prior to the expiration date of the current certificate.

https://ww2.arb.ca.gov/resources/fact-sheets/fact-sheet-contracting-requirements

Choose one:

☐ Bidder's Certificate of Reported Compliance has been attached to the bid. Listed subcontractors' certificates, where subject to this regulation, have been attached or will be submitted within five (5) calendar days of the bid opening.

☐ Bidder and listed subcontractors do not have a fleet subject to this regulation as outlined in Section 2449(i)(1)-(4).

FAILURE TO PROVIDE THE CERTIFICATES OF REPORTED COMPLIANCE AS DIRECTED MAY RENDER THE BID NON-RESPONSIVE.

A G R E E M E N T

THIS AGREEMENT made at Fresno, in Fresno County, California, by and between _____ hereinafter called the Contractor, and the County of Fresno hereinafter called the Owner.

WITNESSETH: That the Contractor and the Owner, for the consideration hereinafter named, agree as follows:

ARTICLE I. The Contractor agrees to furnish all labor and materials, including tools, implements, and appliances required, but excluding such materials as are mentioned in the specifications to be furnished by the Owner, and to perform all the work in a good and workmanlike manner, free from any and all liens and claims of mechanics, materialmen, teamsters, subcontractors, artisans, machinists, and laborers required for:

AMERICAN AVENUE DISPOSAL SITE PHASE III – MODULES 9 & 10
EXCAVATION AND LINER CONSTRUCTION

18950 W AMERICAN AVE, KERMAN, CA 93630

CONTRACT NUMBER: 23-24-SW

All in strict compliance with the plans, drawings and specifications therefor prepared by the Owner, and other contract documents relating thereto.

ARTICLE II. The Contractor and the Owner agree that the Notice to Bidders and Special Provisions, the Wage Scale (Prevailing Wages), the Plans and Drawings, Addenda and Bulletins thereto, and the Proposal (Bid Book) hereto attached, together with this Agreement, form the contract, and they are as fully a part of the contract as if hereto attached or herein repeated.

All portions of the Standard Specifications of the State of California, Department of Transportation, dated 2015, which are not in conflict with this contract shall be deemed a part of the specifications as though fully therein set forth; provided, however, that revisions to the said Standard Specifications shall apply only to the extent, if any, included in the Project Details of these specifications or as otherwise incorporated directly herein. No part of said specifications which is in conflict with any portion of this agreement, or which is not actually descriptive of the work to be done thereunder, or of the manner in which said work is to be executed, shall be considered as any part of this agreement, but shall be utterly null and void.

ARTICLE III. The Owner agrees to pay the Contractor in current funds for the performance of the contract the sum of **_____ DOLLARS AND xx/100 (_____.___)** it being understood that said price is based upon the estimated quantities of materials to be used as set forth in the Proposal, except where provisions are made in the contract documents whereby the estimated quantities shall constitute the final quantity; that upon completion of the project the final contract prices shall be revised by change order, if necessary, to reflect the true quantities used at the stated unit price thereof as contained in the Contractor's Proposal hereto attached. Payments on account thereof will be made as set forth in the special provisions.

ARTICLE IV. If the Contractor should be adjudged a bankrupt, or if he or she should make a general assignment for the benefit of his or her creditors, or if a receiver should be appointed on account of his or her insolvency, or if he or she or any of his or her subcontractors should persistently violate any of

the provisions of the contract, or if he or she should persistently or repeatedly refuse or should fail, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or if he or she should fail to make prompt payment to subcontractors or for material or labor, or persistently disregard laws, ordinances or the instructions of the Engineer, then the Owner may, upon certificate of the Engineer when sufficient cause exists to justify such action, serve written notice upon the Contractor and his surety of its intention to terminate the contract, and unless within five days after the serving of such notice, such violations shall cease and satisfactory arrangements for correction thereof be made, the contract shall, upon the expiration of said five days, cease and terminate.

In the event of any such termination, the Owner shall immediately serve written notice thereof upon the surety and the Contractor, and the surety shall have the right to take over and perform the contract, provided, however, that if the surety within ten (10) days after the serving upon it of notice of termination does not give the Owner written notice of its intention to take over and perform the contract or does not commence performance thereof within the ten (10) days stated above from the date of the serving of such notice, the Owner may take over the work and prosecute the same to completion by contract or by any other method it may deem advisable, for the account and at the expense of the Contractor, and the Contractor and his surety shall be liable to the Owner for any excess cost occasioned the Owner thereby, and in such event the Owner may without liability for so doing, take possession of and utilize in completing the work such materials, appliances, plant and other property belonging to the Contractor as may be on the site of the work and necessary therefor. In such case the Contractor shall not be entitled to receive any further payment until the work is finished. If the unpaid balance of the contract price shall exceed the expenses of finishing the work, including compensation for additional managerial and administrative services, such excess shall be paid to the Contractor. If such expense shall exceed such unpaid balance, the Contractor shall pay the difference to the Owner. The expense incurred by the Owner, as herein provided and damage incurred through the Contractor's default, shall be certified by the Engineer.

ARTICLE V. To the fullest extent permitted by law with respect to any work required to be done under this contract, the Contractor will indemnify and hold harmless the COUNTY OF FRESNO, STATE OF CALIFORNIA, UNITED STATES OF AMERICA, GEO-LOGIC ASSOCIATES, TETRA TECH BAS, and all other participating public agencies, whether or not said agencies are named herein, who have jurisdiction within the areas in which the work is to be performed, and all officers and employees of the Owner, the County, the State, the United States and said other participating agencies, from any and all costs and expenses, attorney fees and court costs, damages, liabilities, claims and losses occurring or resulting to COUNTY in connection with the performance, or failure to perform, by CONTRACTOR, its officers, agents or employees under this Agreement, and from any and all costs and expenses, attorney fees and court costs, damages, liabilities, claims and losses occurring or resulting to any person, firm or corporation who may be injured or damaged by the performance, or failure to perform, of CONTRACTOR, its officers, agents or employees under this Agreement. In addition, CONTRACTOR agrees to indemnify COUNTY for Federal, State of California and/or local audit exceptions resulting from non-compliance herein on the part of CONTRACTOR.

CONTRACTOR agrees to indemnify, save, hold harmless, and at COUNTY'S request, defend the COUNTY, its officers, agents, and employees from any and all costs and expenses, damages, liabilities, claims, and losses occurring or resulting to COUNTY in connection with the performance, or failure to perform, by CONTRACTOR, its officers, agents, or employees under this Agreement, and from any and all costs and expenses, damages, liabilities, claims, and losses occurring or resulting to any person, firm, or corporation who may be injured or damaged by the performance, or failure to perform, of CONTRACTOR, its officers, agents, or employees under this Agreement.

The Certificate of Insurance shall be issued in duplicate, to the COUNTY OF FRESNO and all other participating agencies, whether or not said agencies are named herein, who contribute to the cost of the work or have jurisdiction over areas in which the work is to be performed and all officers and employees of said agencies while acting within the course and scope of their duties and responsibilities.

In the event CONTRACTOR fails to keep in effect at all times insurance coverage as herein provided, the COUNTY may, in addition to other remedies it may have, suspend or terminate this Agreement upon the occurrence of such event.

All policies shall be with admitted insurers licensed to do business in the State of California. Insurance purchased shall be purchased from companies possessing a current A.M Best Company rating of A FSC VII or better.

Without limiting the COUNTY'S right to obtain indemnification from CONTRACTOR or any third parties, CONTRACTOR, at its sole expense, shall maintain in full force and effect, the following insurance policies or a program of self-insurance, including but not limited to, an insurance pooling arrangement or Joint Powers Agreement (JPA) throughout the term of the Agreement:

A. Commercial General Liability

Commercial General Liability Insurance with limits not less than those shown in the following table:

Liability Insurance Requirements

Total bid	For each occurrence[a]	Aggregate for products/completed operation	General aggregate[b]	Umbrella or excess liability[c]
≤ $1,000,000	$1,000,000	$2,000,000	$2,000,000	$5,000,000
> $1,000,000 ≤ $10,000,000	$1,000,000	$2,000,000	$2,000,000	$10,000,000
> $10,000,000 ≤ $25,000,000	$2,000,000	$2,000,000	$4,000,000	$15,000,000
> $25,000,000	$2,000,000	$2,000,000	$4,000,000	$25,000,000

[a]Combined single limit for bodily injury and property damage.
[b]This limit must apply separately to your work under this Contract.
[c]The umbrella or excess policy must contain a clause stating that it takes effect (drops down) in the event the primary limits are impaired or exhausted.

This policy shall be issued on a per occurrence basis. COUNTY may require specific coverages including completed operations, products liability, contractual liability, Explosion-Collapse-Underground, fire legal liability, or any other liability insurance deemed necessary because of the of the nature of this contract.

Such Commercial General Liability insurance shall name the County of Fresno, its officers, agents, and employees, individually and collectively, as additional insured, but only insofar as the operations under this Agreement are concerned. Such coverage for additional insured shall apply as primary insurance and any other insurance, or self-insurance, maintained by COUNTY, its officers, agents and employees shall be excess only and not contributing with insurance provided under CONTRACTOR's policies herein. This insurance shall not be cancelled or changed without a minimum of thirty (30) days advance written notice given to COUNTY. CONTRACTOR shall obtain endorsements to the Commercial General Liability insurance policy naming COUNTY as an additional insured and providing for a thirty (30) day prior written notice of cancellation or change in terms or coverage.

Within eight (8) days from date CONTRACTOR executes this Agreement, CONTRACTOR shall provide certificates of insurance and endorsement as stated above for all of the foregoing policies, as required herein, to the County of Fresno, or to designservices@fresnocountyca.gov, stating that such insurance coverages have been obtained and are in full force; that the County of Fresno, its officers, agents and employees will not be responsible for an premiums on the policies; that such Commercial General Liability insurance names the County of Fresno, its officers, agents, and employees, individually and collectively, as additional insured, but only insofar as the operations under this Agreement are

concerned; that such coverage for additional insured shall apply as primary insurance an any other insurance, or self- insurance shall not be cancelled or changed without a minimum of thirty (30) days advance, written notice given to COUNTY.

CONTRACTOR shall obtain endorsements to the Commercial General Liability insurance naming the County of Fresno, its officers, agents, and employees, individually and collectively, as additional insured, but only insofar as the operations under this Agreement are concerned. Such coverage for additional insured shall apply as primary insurance and any other insurance, or self-insurance, maintained by COUNTY, its officers, agents, and employees shall be excess only and not contributing with insurance provided under CONTRACTOR'S policies herein. This insurance shall not be cancelled or changed without a minimum or thirty (30) days advance written notice given to COUNTY.

B. Automobile Liability

Comprehensive Automobile Liability Insurance with limits of not less than One Million Dollars ($1,000,000) per accident for bodily injury and property damage. Coverage should include owned and non-owned vehicles used in connection with this Agreement and all applicable endorsements.

C. Professional Liability

If CONTRACTOR is a licensed professional or employs professional staff, (e.g., Architect, Engineer, Surveyor, etc.) in providing services, Professional Liability Insurance with limits of not less than One Million Dollars ($1,000,000.00) per occurrence, Three Million Dollars ($3,000,000.00) annual aggregate with a provision for 3 year tail coverage.

D. Worker's Compensation

A policy of Worker's Compensation insurance as may be required by the California Labor Code.

ARTICLE VI. Contractor represents that he has secured the payment of Worker's Compensation in compliance with the provisions of the Labor Code of the State of California and during the performance of the work contemplated herein will continue so to comply with said provisions of said Code. Contractor shall supply the Owner with certificates of insurance, in duplicate, evidencing that Worker's Compensation Insurance is in effect and providing that the Owner will receive ten days notice of cancellation. If Contractor self-insures Worker's Compensation, Certificate of Consent to Self-insure should be provided the Owner.

ARTICLE VII. The Contractor shall forthwith furnish in duplicate, a faithful performance bond in an amount equal to 100% of the contract price and a payment bond in an amount equal to 100% of the contract price, both bonds to be written by a surety company acceptable to the Owner and in the form prescribed by law.

The payment bond shall contain provisions such that if the Contractor or his subcontractors shall fail to pay (a) amounts due under the Unemployment Insurance Code with respect to work performed under the contract, or (b) any amounts required to be deducted, withheld and paid over to the Employment Development Department and to the Franchise Tax Board from the wages of the employees of the Contractor and subcontractors pursuant to Section 13020 of the Unemployment Insurance Code with respect to such work and labor, then the surety will pay these amounts. In case suit is brought upon the payment bond, the surety will pay a reasonable attorney's fee to be fixed by the court.

ARTICLE VIII. This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

Except as provided in Labor Code section 1725.5(f), no contractor or subcontractor may be listed on a bid proposal for a public works project 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)].

Except as provided in Labor Code section 1725.5(f), no contractor or subcontractor may be awarded a contract for public work on a public works project or engage in the performance of work on any public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

Contractor shall comply with all applicable laws and regulations relating to wages and employment, including all requirements imposed by the California Department of Industrial Relations (DIR). Contractor shall cooperate with County to furnish timely all information necessary for County's completion of the form required to be submitted by County when registering the Project on the DIR website; and County thereafter shall provide to Contractor the "Project ID Number" assigned by DIR in order to facilitate Contactor's submission to DIR of its certified payrolls for the Project, in the manner required and using such form as may be prescribed by DIR, in accordance with the provisions of Labor Code section 1771.4(a)(3).

ARTICLE IX: Governing Law – Venue for any action arising out of or relating to this Agreement shall be in Fresno County, California. This Agreement shall be governed by the laws of the State of California.

This Contract, **23-24 SW**, was awarded by the Board of Supervisors on _____. It has been reviewed by the Department of Public Works and Planning and is in proper order for signature of the Chairman of the Board of Supervisors.

IN WITNESS WHEREOF, they have executed this Agreement this _____ day of

_____, 2024

_____	COUNTY OF FRESNO
(CONTRACTOR)	(OWNER)
By _____	By _____
	Nathan Magsig, Chairman of the Board of Supervisors of the County of Fresno
Title _____	**ATTEST:** Bernice E. Seidel Clerk of the Board of Supervisors County of Fresno, State of California
	By _____
	Deputy