

10-1.59

TEMPORARY CRASH CUSHION MODULE:

This work shall consist of furnishing, installing, and maintaining sand filled temporary crash cushion modules in groupings or arrays at each location shown on the plans, as specified in these special provisions or where designated by the Engineer. The grouping or array of sand filled modules shall form a complete sand filled temporary crash cushion in conformance with the details shown on the plans and these special provisions.

Attention is directed to "Temporary Railing" of these special provisions.

Temporary crash cushions shall be secured in place prior to commencing work for which the temporary crash cushions are required.

Whenever the work or the Contractor's operations establishes a fixed obstacle, the exposed fixed obstacle shall be protected with a sand filled temporary crash cushion. The sand filled temporary crash cushion shall be in place prior to opening the lanes adjacent to the fixed obstacle to public traffic.

Sand filled temporary crash cushions shall be maintained in place at each location, including times when work is not actively in progress. Sand filled temporary crash cushions may be removed during a work period for access to the work provided that the exposed fixed obstacle is 4.6 m or more from a lane carrying public traffic and the temporary crash cushion is reset to protect the obstacle prior to the end of the work period in which the fixed obstacle was exposed. When no longer required, as determined by the Engineer, sand filled temporary crash cushions shall be removed from the site of the work. At the Contractor's option, the modules for use in sand filled temporary crash cushions shall be either Energite III Inertial Modules, Fitch Inertial Modules or Traffix Sand Barrels manufactured after March 31, 1997, or equal:

1. Energite III and Fitch Inertial Modules, manufactured by Energy Absorption Systems, Inc., 35 East Wacker Drive, Suite 1100, Chicago, IL 60601:
 - 1.1. Northern California: Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, telephone (800) 884-8274, FAX (916) 387-9734
 - 1.2. Southern California: Traffic Control Service, Inc., 1818 E. Orangethorpe, Fullerton, CA 92831-5324, telephone (800) 222-8274, FAX (714) 526-9501
2. Traffix Sand Barrels, manufactured by Traffix Devices, Inc., 220 Calle Pintero, San Clemente, CA 92672, telephone (949) 361-5663, FAX (949) 361-9205
 - 2.1. Northern California: United Rentals, Inc., 1533 Berger Drive, San Jose, CA 95112, telephone (408) 287-4303, FAX (408) 287-1929
 - 2.2. Southern California: Statewide Safety & Sign, Inc., P.O. Box 1440, Pismo Beach, CA 93448, telephone (800) 559-7080, FAX (805) 929-5786

Modules contained in each temporary crash cushion shall be of the same type at each location. The color of the modules shall be the standard yellow color, as furnished by the vendor, with black lids. The modules shall exhibit good workmanship free from structural

flaws and objectionable surface defects. The modules need not be new. Good used undamaged modules conforming to color and quality of the types specified herein may be utilized. If used Fitch modules requiring a seal are furnished, the top edge of the seal shall be securely fastened to the wall of the module by a continuous strip of heavy duty tape. Modules shall be filled with sand in conformance with the manufacturer's directions, and to the sand capacity in kilograms for each module shown on the plans. Sand for filling the modules shall be clean washed concrete sand of commercial quality. At the time of placing in the modules, the sand shall contain not more than 7 percent water as determined by California Test 226.

Modules damaged due to the Contractor's operations shall be repaired immediately by the Contractor at the Contractor's expense. Modules damaged beyond repair, as determined by the Engineer, due to the Contractor's operations shall be removed and replaced by the Contractor at the Contractor's expense.

Temporary crash cushion modules may be placed on movable pallets or frames. Comply with dimensions shown on the plans. The pallets or frames shall provide a full bearing base beneath the modules. The modules and supporting pallets or frames shall not be moved by sliding or skidding along the pavement or bridge deck.

A Type R or P marker panel shall be attached to the front of the crash cushion as shown on the plans, when the closest point of the crash cushion array is within 3.6 m of the traveled way. The marker panel, when required, shall be firmly fastened to the crash cushion with commercial quality hardware or by other methods determined by the Engineer.

At the completion of the project, temporary crash cushion modules, sand filling, pallets or frames, and marker panels shall become the property of the Contractor and shall be removed from the site of the work. Temporary crash cushion modules shall not be installed in the permanent work.

MEASUREMENT AND PAYMENT

Temporary crash cushion modules will be measured by the unit as determined from the actual count of modules used in the work or ordered by the Engineer at each location. Temporary crash cushion modules placed in conformance with the provisions in "Public Safety" of these special provisions and modules placed in excess of the number specified or shown will not be measured nor paid for.

Repairing modules damaged by public traffic will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications. Modules damaged beyond repair by public traffic, when ordered by the Engineer, shall be removed and replaced immediately by the Contractor. Modules replaced due to damage by public traffic will be measured and paid for as temporary crash cushion module.

If the Engineer orders a lateral move of the sand filled temporary crash cushions and the repositioning is not shown on the plans, moving the sand filled temporary crash cushion will be paid for as extra work as provided in Section 4-1.03D of the Standard Specifications and these temporary crash cushion modules will not be counted for payment in the new position.

The contract unit price paid for temporary crash cushion module shall include full compensation for furnishing all labor, materials (including sand, pallets or frames and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing, installing, maintaining, moving, and resetting during a work period for access to the work, and removing from the site of the work when no longer required (including those damaged by public traffic) sand filled temporary crash cushion modules, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.60 REMOVE YELLOW TRAFFIC STRIPE (HAZARDOUS WASTE):

GENERAL

Summary

This work includes removing existing yellow painted traffic stripe at the locations shown on the plans. The residue from the removal of this material is a hazardous waste.

Residue from removal of yellow painted traffic stripe contains lead chromate. The average lead concentration is greater than or equal to 1000 mg/kg total lead or 5 mg/l soluble lead. When applied to the roadway, the yellow painted traffic stripe contained as much as 2.6 percent lead. Residue produced from the removal of this yellow painted traffic stripe contains heavy metals in concentrations that exceed thresholds established by the Health and Safety Code and 22 CA Code of Regs. For bidding purposes, assume that the residue is not regulated under the Federal Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 et seq.. Yellow paint may produce toxic fumes when heated.

Submittals

Lead Compliance Plan: Submit a lead compliance plan under Section 7-1.07, "Lead Compliance Plan," of the Standard Specifications.

Work Plan: Submit a work plan for the removal, containment, storage, and disposal of yellow painted traffic stripe for acceptance not less than 15 days prior to the start of the removal operations. The work plan must include:

1. Objective of the operation
2. Removal equipment
3. Type of hazardous waste storage containers
4. Container storage location and how it will be secured
5. Hazardous waste sampling protocol and QA/QC requirements and procedures
6. Qualifications of sampling personnel
7. Analytical lab that will perform the analyses
8. Certification documentation of the hazardous waste hauler that will transport the hazardous waste
9. Disposal site that will accept the hazardous waste residue

The Engineer will review the work plan within 5 business days of receipt.

Do not perform work that generates hazardous waste residue until the work plan has been accepted by the Engineer. The Engineer's review and acceptance does not waive any

contract requirements and does not relieve the Contractor from complying with Federal, State, and local laws, regulations, and requirements.

Correct any rejected work plan and resubmit a corrected work plan within 5 business days of notification by the Engineer; at which time a new review period of 5 business days will begin.

Analytical Test Results: Submit analytical test results of the residue from removal of yellow painted traffic stripe, including chain of custody documentation, for review and acceptance before:

1. Requesting the Engineer's signature on the waste profile requested by the disposal facility
2. Requesting the Engineer obtain an EPA ID no. for disposal
3. Removing the residue from the site

United States Environmental Protection Agency Identification Number Request: Submit a request for the U.S. EPA ID no. when the Engineer accepts analytical test results documenting that residue from removal of yellow painted traffic stripe is a hazardous waste.

Disposal Documentation: Submit receiving landfill documentation of proper disposal within 5 business days of residue transport from the project.

CONSTRUCTION

Where grinding or other approved methods are used to remove yellow painted traffic stripe that will produce a hazardous waste residue, the removed residue, including dust, must be contained and collected immediately. Use a HEPA filter-equipped vacuum attachment operated concurrently with the removal operations or other equally effective approved methods for collection of the residue.

Store hazardous waste residue in labeled and covered containers. Labels must comply with the provisions of 22 CA Code of Regs §§66262.31 and 66262.32. Mark labels with:

1. Date the hazardous waste is generated
2. The words "Hazardous Waste"
3. Composition and physical state of the hazardous waste (for example, asphalt grindings with paint)
4. The word "Toxic"
5. Name, address, and telephone no. of the Engineer
6. Contract no.
7. Contractor or subcontractor name

Use metal containers approved by the U.S. Department of Transportation for the transportation and temporary storage of the removed residue. Handle the containers such that no spillage occurs. Store containers in a secured enclosure. Acceptable secure enclosures include a locked chain link fenced area or a lockable shipping container located within the project limits until disposal as approved.

Make necessary arrangements to test the yellow paint hazardous waste residue as required by the disposal facility and these special provisions. Testing must include, at a minimum:

1. Total lead by EPA Method 6010C
2. Total chromium by US EPA Method 7000 series
3. Soluble lead by California Waste Extraction Test
4. Soluble chromium by California Waste Extraction Test
5. Soluble lead by Toxicity Characteristic Leaching Procedure
6. Soluble chromium by Toxicity Characteristic Leaching Procedure

From the 1st 220 gallons of hazardous waste or portion thereof if less than 220 gallons of hazardous waste are produced, a minimum of 4 randomly selected samples must be taken and analyzed individually. Samples must not be composited. From each additional 880 gallons of hazardous waste or portion thereof if less than 880 gallons are produced, a minimum of 1 additional random sample must be taken and analyzed. Use chain of custody procedures consistent with Chapter 9 of U.S. EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846) while transporting samples from the project to the laboratory. Each sample must be homogenized before analysis by the laboratory performing the analyses. A sample aliquot sufficient to cover the amount necessary for the total and the soluble analyses must then be taken. This aliquot must be homogenized a 2nd time and the total and soluble analyses run on this aliquot. The homogenization process must not include grinding of the samples. Submit the name and location of the disposal facility that will be accepting the hazardous waste and the analytical laboratory along with the testing requirements not less than 5 business days before the start of removal of yellow painted traffic stripe. The analytical laboratory must be certified by the CA Department of Public Health Environmental Laboratory Accreditation Program for all analyses to be performed.

After the Engineer accepts the analytical test results, dispose of yellow paint hazardous waste residue at a Class 1 disposal facility located in CA under the requirements of the disposal facility operator within 90 days after accumulating 220 pounds of residue and dust.

If less than 220 pounds of hazardous waste residue and dust is generated in total, it must be disposed of within 30 days after the start of accumulation of the residue and dust.

Use a hazardous waste manifest and a transporter registered with the CA Department of Toxic Substance Control. The Engineer will obtain the U.S. EPA ID no. and will sign all manifests as the generator within 2 business days of receiving and accepting the analytical test results and receiving your request for the U.S. EPA ID no.

If analytical test results demonstrate that the residue is a non-hazardous waste and the Engineer agrees, dispose of the residue at an appropriately permitted Class II or Class III facility under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

MEASUREMENT AND PAYMENT

Remove yellow painted traffic stripe will be measured and paid for by the meter as provided in Section 15-2.06, "Measurement," and 15-2.07, "Payment," of the Standard Specifications.

The contract price paid per linear meter for remove yellow painted traffic stripe includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all of the work involved in removal, containment, storage, and disposal, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Full compensation for (1) work plan for the removal, containment, storage, and disposal of yellow painted traffic stripe hazardous waste residue, (2) analytical test results, (3) US EPA ID no. request, and (4) receiving landfill documentation of proper disposal are included in the contract prices paid per linear meter for remove yellow painted traffic stripe and no separate payment will be made therefor.

Additional disposal costs for hazardous waste residue regulated under RCRA, as determined by test results, will be paid for as extra work as specified in Section 4-1.03D, "Extra Work," of the Standard Specifications.

If analytical test results demonstrate that the residue is a non-hazardous waste and the Engineer agrees to disposal at a non-hazardous waste disposal facility, no cost adjustment will be made.

10-1.61 TREATED WOOD WASTE:

GENERAL

Summary

This work includes handling, storing, transporting, and disposing of treated wood waste (TWW).

Wood removed from metal beam guard railing is treated with one or more of the following:

1. Creosote
2. Pentachlorophenol
3. Copper azole
4. Copper boron azole
5. Chromated copper arsenate
6. Ammoniacal copper zinc arsenate
7. Copper naphthenate
8. Alkaline copper quaternary

Manage TWW under Title 22 CA Code of Regulations, Division 4.5, Chapter 34.

Submittals

For disposal of TWW submit a copy of each completed shipping record and weight receipt to the Engineer within 5 business days of disposal.

CONSTRUCTION

Provide training to personnel who handle TWW or may come in contact with TWW that includes:

1. All applicable requirements of Title 8 CA Code of Regulations
2. Procedures for identifying and segregating TWW
3. Safe handling practices
4. Requirements of Title 22 CA Code of Regulations, Division 4.5, Chapter 34
5. Proper disposal methods

Store TWW before disposal using any of the following methods:

1. Elevate on blocks above a reasonably foreseeable run-on elevation and protect from precipitation
2. Place in water-resistant containers designed for shipping or solid waste collection
3. Place on a containment surface or pad protected from run-on and precipitation
4. Place in a storage building as defined in Title 22 CA Code of Regulations, Div. 4.5, Chp. 34; Section 67386.6 (a)(2)(c).

Prevent unauthorized access to TWW using a secured enclosure such as a locked chain link fenced area or a lockable shipping container located within the project limits.

Resize and segregate TWW at a location where debris from the operation including sawdust and chips can be contained. Collect and manage the debris as TWW.

Provide water-resistant labels, that comply with Title 22 CA Code of Regulations, Division 4.5, Chapter 34, to clearly mark and identify TWW and accumulation areas. Labels must include:

1. Caltrans, District number, Construction, contract number
2. District office address
3. Engineer's name, address, and telephone number
4. Contractor's contact name and telephone number
5. Date placed in storage

Before transporting TWW, obtain an agreement from the receiving facility that the treated wood waste will be accepted. Protect shipments of treated wood waste from loss and exposure to precipitation. For projects with 10,000 pounds or more of TWW, request a hazardous waste generator identification number from the Engineer at least 5 business days before the first shipment. Each shipment must be accompanied by a shipping record such as a bill of lading or invoice that includes:

1. Caltrans with district number
2. Construction contract number

3. District office address
4. Engineer's name, address, and telephone number
5. Contractor's contact name and telephone number
6. Receiving facility name and address
7. Waste description: treated wood waste (preservative type if known or unknown/mixture)
8. Project location
9. Estimated quantity of shipment by weight or volume
10. Date of transport
11. Date of receipt by the receiving TWW facility
12. Weight of shipment as measured by the receiving TWW facility
13. For projects with 10,000 pounds or more of TWW include the generator identification number

The shipping record must be at least a 4-part carbon or carbonless 216 mm x 279 mm (8-1/2" x 11") form to allow retention of copies by the Engineer, transporter, and disposal facility.

Dispose of TWW at an approved TWW facility. A list of currently approved TWW facilities may be viewed at:

http://www.dtsc.ca.gov/HazardousWaste/upload/TWW_Confirmed_Landfill_List.pdf

Dispose of TWW within:

1. 90 days of generation if stored on blocks
2. 180 days of generation if stored on a containment surface or pad.
3. One year of generation if filling a water-resistant container, or 90 days after the container is full, whichever is shorter
4. One year of generation if storing in a storage building as defined in Title 22 CA code of Regulations, Div. 4.5, Chp. 34, Section 67386.6(a)(2)(C)

MEASUREMENT AND PAYMENT

Full compensation for handling, storing, transporting, and disposing TWW, including personnel training, is included in the contract price paid for the various items of work involved and no additional compensation will be allowed therefor.

10-1.62 EXISTING HIGHWAY FACILITIES:

The work performed in connection with various existing highway facilities shall conform to the provisions in Section 15, "Existing Highway Facilities," of the Standard Specifications and these special provisions.

EARTH MATERIAL CONTAINING LEAD

General

This work includes handling earth material containing lead under the Standard Specifications and these special provisions.

Submittals

Submit a lead compliance plan under Section 7-1.07, "Lead Compliance Plan," of the Standard Specifications.

Project Conditions

Lead is present in earth material within the project limits at average concentrations below 1,000 mg/kg total lead and below 5 mg/l soluble lead. Earth material within the project limits:

1. Is not a hazardous waste
2. Does not require disposal at a permitted landfill or solid waste disposal facility

Construction

Handle earth material containing lead under all applicable laws, rules, and regulations, including those of the following agencies:

1. Cal/OSHA
2. CA Regional Water Quality Control Board; Region 9 – San Diego Board
3. CA Department of Toxic Substances Control

Measurement and Payment

Full compensation for handling earth material containing lead is included in the contract price paid per cubic meter for roadway excavataion, and no additional compensation will be allowed therefor.

REMOVE METAL BEAM GUARD RAILING

Existing metal beam guard railing, where shown on the plans to be removed, shall be removed and disposed of.

Existing concrete anchors or steel foundation tubes shall be completely removed and disposed of. Full compensation for removing concrete anchors shall be considered as included in the contract price paid per meter for remove metal beam guard railing and no separate payment will be made therefor.

MEASUREMENT AND PAYMENT

The contract price paid per meter for Remove Metal Beam Guard Railing shall include full compensation for furnishing all labor, tools, materials, equipment and incidentals, and for doing all the work involved, including removing cable anchor assemblies, terminal anchor assemblies or steel foundation tubes, and no separate payment will be made therefor

REMOVE CANTILEVER FLASHING BEACON

Existing cantilever flashing beacons, where shown on the plans to be removed, shall be removed and disposed of.

Overhead sign structure removal shall consist of removing posts, frames, foundations, mast arms, sign panels, , and sign lighting electrical equipment.

Flashing beacon shall not be removed until the structure is no longer required for public warning and traffic safety purposes.

Concrete foundations shall be removed and disposed of.

Electrical wiring shall be removed to the nearest pull box. Fuses within spliced connections in the pull box shall be removed and disposed of.

Removed electrical equipment, shall become the Contractor's property and shall be disposed of outside the highway right of way.

PAYMENT

Remove cantilever flashing beacon will be measured and paid for on the basis of lump sum.

The contract lump sum price paid for remove cantilever flashing beacon shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in removing cantilever flashing beacon, as shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

REMOVE PAVEMENT MARKER

Existing pavement markers, including underlying adhesive, when no longer required for traffic lane delineation as determined by the Engineer, shall be removed and disposed of.

MEASUREMENT AND PAYMENT

Remove pavement marker will be measured and paid for by the unit of the actual unit removed determined from actual count as provided in Section 15-2.06, "Measurement," and 15-2.07, "Payment," of the Standard Specifications.

REMOVE TRAFFIC STRIPE AND PAVEMENT MARKING

This work includes removing existing traffic stripe and pavement marking at the locations shown on the plans.

Submit a lead compliance plan under Section 7-1.07, "Lead Compliance Plan," of the Standard Specifications.

Waste residue from removal of thermoplastic and painted traffic stripe and pavement marking is a non-hazardous waste residue and contains lead in average concentrations less than 1000 mg/kg total lead and 5 mg/L soluble lead. This waste residue does not contain heavy metals in concentrations that exceed thresholds established by the Health and Safety Code and 22 CA Code of Regs and is not regulated under the Federal Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 et seq.

MEASUREMENT AND PAYMENT

Remove Traffic Stripes will be measured for payment per linear meter and Remove Pavement Markings will be measured for payment by the square meter, in accordance with the provisions in Section 15-2.06, "Measurement," and 15-2.07, "Payment," of the Standard Specifications.

RESIDUE CONTAINING HIGH LEAD CONCENTRATION PAINTS

Residue from grinding existing pavement, including any bituminous or polymer seals, is a non-hazardous waste containing lead in average concentrations less than 1000 mg/kg total lead and 5 mg/L soluble lead. This residue does not contain heavy metals in concentrations that exceed thresholds established by the Health and Safety Code and 22 CA Code of Regs and is not regulated under the Federal Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 et seq.

Submit a lead compliance plan under Section 7-1.07, "Lead Compliance Plan," of the Standard Specifications.

PAYMENT

Full compensation for conforming to the provisions herein shall be considered as included in the lump sum price paid for Lead Compliance Plan (Stripe Removal) and no separate payment will be made therefor.

REMOVE DRAINAGE FACILITY

Existing pipe culverts, where any portion of these structures is within one meter of the grading plane in excavation areas, or within 0.3-m of original ground in embankment areas, or where shown on the plans to be removed, shall be completely removed and disposed of.

MEASUREMENT AND PAYMENT

Removal of Drainage Facility (pipe culvert) will be measured and paid for by the unit in accordance with the provisions in Section 15-2.06, "Measurement," and 15-2.07, "Payment," of the Standard Specifications.

REMOVE ASPHALT CONCRETE DIKE

Existing asphalt concrete dike, where shown on the plans to be removed, shall be removed.

The dike shall be removed in such a manner that the surfacing which is to remain in place is not damaged.

The dike shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.

PAYMENT

Quantities of removed asphalt concrete dike will be measured and paid for by the cubic meter as roadway excavation and no separate payment will be made therefor.

REMOVE ROADSIDE SIGN

Existing roadside signs, at those locations shown on the plans to be removed, shall be removed and disposed of.

Existing roadside signs shall not be removed until replacement signs have been installed or until the existing signs are no longer required for the direction of public traffic, unless otherwise directed by the Engineer.

MEASUREMENT AND PAYMENT

Quantities of remove roadside sign will be measured and paid for by the unit in accordance with the provisions in Section 15-2.06, "Measurement," and 15-2.07, "Payment," of the Standard Specifications, determined from actual count as determined by the Engineer.

REMOVE FENCE (TYPE BW)

Existing barbed wire fence, at the locations shown on the plans, shall be removed and disposed of.

Fence removed in excess of the limits shown on plans shall be reconstructed, as directed by the Engineer, at no cost to the State.

MEASUREMENT AND PAYMENT

Remove fence (Type BW) will be measured and paid for by the meter as provided in Section 15-2.06, "Measurement" and Section 15-2.07, "Payment" of the Standard Specifications.

RESET MAILBOX

Existing mailboxes shall be removed and reset in conformance with the details shown on the plans.

During construction operations, the mailboxes shall be moved as necessary to clear the way for the Contractor's operations, but shall be accessible for delivery at all times. During

construction, the mailboxes shall be installed on posts set in the ground or the mailboxes may be installed on temporary supports approved by the Engineer.

When construction is complete, the mailboxes shall be installed in the final position on new redwood posts.

Redwood posts shall conform to the provisions for sign posts in Section 56-2.02B, "Wood Posts," of the Standard Specifications.

The space around the posts shall be backfilled with earthy material. The backfill material shall be placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted.

Existing posts, mounts, and hardware shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

MEASUREMENT AND PAYMENT

Reset mailbox will be measured and paid for by the unit of the actual units reset in place as provided in Section 15-2.06, "Measurement" and Section 15-2.07, "Payment" of the Standard Specifications. A multiple-box installation shall consist of 2 mailboxes installed on a single post. Each multi-box installation shall be considered as 2 units for payment purposes.

Newspaper boxes on individual posts will be considered as mailboxes for measurement and payment.

Newspaper boxes attached to existing mailbox posts shall be removed and fastened to the new mailbox posts and no separate payment will be made therefor.

Full compensation for disposing of existing posts, mounts, and hardware; moving and maintaining the mailboxes (regardless of the number of moves required); and for furnishing new posts, planks, and hardware shall be considered as included in the contract unit price paid for reset mailbox and no additional compensation will be allowed therefor.

RELOCATE ROADSIDE SIGN

Existing roadside signs shall be removed and relocated to the new locations shown on the plans.

Each roadside sign shall be installed at the new location on the same day that the sign is removed from its original location.

Two holes shall be drilled in each existing post as required to provide the breakaway feature shown on the plans.

MEASUREMENT AND PAYMENT

Relocate Roadside Sign will be measured and paid for by the unit of the actual units relocated as provided in Section 15-2.06, "Measurement" and Section 15-2.07, "Payment" of the Standard Specifications.

OBLITERATE SURFACING

Existing surfacing, when no longer required for the passage of public traffic, shall be obliterated at the locations shown on the plans.

Surfacing shall not be obliterated by the earth cover method.

Obliteration shall consist of rooting, plowing, pulverizing or scarifying the existing surfacing in conformance with the provisions in Section 15-2.02A, "Obliterating Roads and Detours," of the Standard Specifications.

Full compensation for Obliterate Surfacing shall be considered as included in the lump Sum contract price paid for Clearing and Grubbing and no additional compensation will be allowed.

COLD PLANE ASPHALT CONCRETE PAVEMENT

Existing asphalt concrete pavement shall be cold planed at the locations and to the dimensions shown on the plans.

Planing asphalt concrete pavement shall be performed by the cold planing method. Planing of the asphalt concrete pavement shall not be done by the heater planing method.

Cold planing machines shall be equipped with a cutter head not less than 750 mm in width and shall be operated so that no fumes or smoke will be produced. The cold planing machine shall plane the pavement without requiring the use of a heating device to soften the pavement during or prior to the planing operation.

The depth, width, and shape of the cut shall be as shown on the plans or as designated by the Engineer. The final cut shall result in a uniform surface conforming to the plans. The outside lines of the planed area shall be neat and uniform. Planing asphalt concrete pavement operations shall be performed without damage to the surfacing to remain in place.

Planed widths of pavement shall be continuous except for intersections at cross streets where the planing shall be carried around the corners and through the conform lines. Following planing operations, a drop-off of more than 45 mm will not be allowed between adjacent lanes open to public traffic.

Where transverse joints are planed in the pavement at conform lines no drop-off shall remain between the existing pavement and the planed area when the pavement is opened to public traffic. If Hot Mix Asphalt (HMA) has not been placed to the level of existing pavement before the pavement is to be opened to public traffic a temporary HMA taper

shall be constructed. HMA for temporary tapers shall be placed to the level of the existing pavement and tapered on a slope of 1:30 (Vertical: Horizontal) or flatter to the level of the planed area.

HMA for temporary tapers shall be the same quality as the HMA used elsewhere on the project or shall conform to the material requirements for minor HMA. HMA for tapers shall be compacted by any method that will produce a smooth riding surface. Temporary HMA tapers shall be completely removed, including the removal of loose material from the underlying surface, before placing the permanent surfacing. The removed material shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Operations shall be scheduled so that not more than 7 days shall elapse between the time when transverse joints are planed in the pavement at the conform lines and the permanent surfacing is placed at the conform lines.

The material planed from the roadway surface, including material deposited in existing gutters or on the adjacent traveled way, shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. Removal operations of cold planed material shall be concurrent with planing operations and follow within 15 m of the planer, unless otherwise directed by the Engineer.

MEASUREMENT AND PAYMENT

Cold plane asphalt concrete pavement will be measured by the square meter. The quantity to be paid for will be the actual area of surface cold planed irrespective of the number of passes required to obtain the depth shown on the plans.

The contract price paid per square meter for cold plane asphalt concrete pavement shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in cold planing asphalt concrete surfacing and disposing of planed material, including furnishing the HMA for and constructing, maintaining, removing, and disposing of temporary HMA tapers, as specified in the Standard Specifications and these special provisions and as directed by the Engineer.

RELOCATE CALL BOXES

Attention is directed to Section 7-1.14 "cooperation" of the Standard Specifications regarding coordination of this work. The Contractor shall maintain and protect the existing call boxes in place for as long as possible. The Contractor shall notify the RCTC "Service Authority for Freeway Emergencies" (SAFE) at (951) 787-7141 (Contact person: Bryan Cunanan) at least 30 calendar days in advance of requiring the removal of the call box. Physical relocation of the call boxes will be made by SAFE or its contractor.

The Contractor must use and complete the RCTC form enclosed in these Special Provisions when notifying RCTC on call box relocations.

PAYMENT

Full compensation for the actual cost of the relocation of the call boxes, as paid by Contractor to SAFE, will be made on a force account basis, in accordance with Section 9-1.03 of the Standard Specifications and these Special Provisions, except that no markups will be allowed. All incidental costs incurred by the Contractor shall be considered as included in the various items of work, and no additional compensation will be allowed therefor.

10-1.63 CLEARING AND GRUBBING:

Clearing and grubbing shall conform to the provisions in Section 16, "Clearing and Grubbing," of the Standard Specifications and these special provisions.

Vegetation shall be cleared and grubbed only within the excavation and embankment slope lines.

Exotic plant species identified by the Engineer that are removed during construction shall be properly handled and disposed of to prevent sprouting or regrowth.

Culverts identified by the Engineer to be cleaned out shall be cleaned out and material properly handled and disposed of.

PAYMENT

Clearing and grubbing will be paid for at a lump sum price as provided in Section 16-1.05, "Measurement" and Section 16-1.06, "Payment" of the Standard Specifications.

Full compensation for Obliterate Surfacing shall be considered as included in the lump Sum contract price paid for Clearing and Grubbing and no additional compensation will be allowed.

10-1.64 WATERING:

Developing a water supply and applying watering shall conform to the provisions in Section 17, "Watering," of the Standard Specifications and these special provisions.

Drilling for water well points and extracting ground water within the right of way or on adjacent private properties as sources of water for use on the project will not be allowed.

10-1.65 EARTHWORK:

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these special provisions.

Surplus excavated material shall become the property of the Contractor and shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Where a portion of the existing surfacing is to be removed, the outline of the area to be removed shall be cut on a neat line with a power-driven saw to a minimum depth of 50 mm before removing the surfacing. Full compensation for cutting the existing surfacing shall be considered as included in the contract price paid per cubic meter for roadway excavation and no additional compensation will be allowed therefor.

Reinforcement or metal attached to reinforced concrete rubble placed in embankments shall not protrude above the grading plane. Prior to placement within 0.6-m below the grading plane of embankments, reinforcement or metal shall be trimmed to no greater than 20 mm from the face of reinforced concrete rubble. Full compensation for trimming reinforcement or metal shall be considered as included in the contract prices paid per cubic meter for the types of excavation shown in the Engineer's estimate, or the contract prices paid for furnishing and placing imported borrow or embankment material, as the case may be, and no additional compensation will be allowed therefor.

At the option of the Contractor, slurry cement backfill, conforming to the provisions in Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications, may be used as structure backfill for pipe culverts, including aluminum and aluminum coated pipe culverts.

MEASUREMENT AND PAYMENT

Earthwork will be measured and paid for by the cubic meter as provided in Section 19-2.08, "Measurement" and Section 19-2.09, "Payment" of the Standard Specifications.

Ditch excavation will be measured and paid for by the cubic meter as provided in Section 19-4.02, "Measurement" and Section 19-4.03, "Payment" of the Standard Specifications.

Full compensation for structure excavation and for furnishing and placing structure backfill shall be considered as included in the contract prices paid for the various items of work involving structure excavation and structure backfill no additional compensation will be allowed therefor.

10-1.66

ROCK EXCAVATION:

GENERAL

Summary

This work includes using hydraulic splitters, pneumatic hammers, blasting, or other roadway excavation techniques approved by the Engineer to fracture rock and construct stable final rock cut faces.

Comply with Sections 12, "Construction Area Traffic Control Devices," and 19, "Earthwork," of the Standard Specifications and "Traffic Control" of these special provisions.

If you choose to use blasting, comply with Federal, State, and local blasting regulations. Regulations containing specific Cal-OSHA requirements for blasting activities include 8 CA Code of Regs, Ch 4, Subchapter 7, Group 18, "Explosive Materials."

Do not perform any drilling or other preparation work for blasting before the Engineer approves the blasting safety plan and personnel assignments. Comply with Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. If, in the opinion of the Engineer, completion of the work is delayed or interfered with by reason of the Engineer's delay in completing the submittal review within the specified time, you will be compensated for resulting losses and an extension of time will be granted in the same manner as provided for in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

You are liable for damages resulting from blasting activities.

Submittal

Blasting Safety Plan

Submit 3 copies of a blasting safety plan for review. The plan must include:

1. References to applicable Federal, State, and local codes and regulations
2. Copies of permits required for blasting activities
3. Business name, contractor license number, address, and telephone number of the blasting subcontractor
4. Proof of current liability insurance and bonding
5. Name, address, telephone number, copies of applicable licenses, and resume of:
 - 5.1. Blaster-in-charge
 - 5.2. Personnel responsible for blast design, loading, and conducting blasting operations
 - 5.3. Safety officer for blasting subcontractor
6. Name, address, and telephone number of the local fire station and law enforcement agencies
7. Detailed description of:
 - 7.1. Location where explosives will be stored
 - 7.2. Security measures to protect and limit access to the explosives
 - 7.3. Transportation means for explosives
 - 7.4. List of personnel permitted to handle the explosives
8. Exclusion zone and limited entry zone for nonblast related operations and personnel surrounding loading and blasting operations
9. Details of warning signals used to alert employees on the job site of an impending blast and to indicate the blast is completed and the area is safe to enter
10. How blasting operations will be conducted
11. Measures to protect blasting operations and personnel from lightning
12. Emergency evacuation procedures for areas where explosives may be present
13. How misfires will be recognized, handled, and resolved including:
 - 13.1. Who will be notified
 - 13.2. How blast zone will be secured until misfire is resolved
 - 13.3. Identification of equipment that may be needed to resolve misfires

14. Details of signs to be used around blasting zones including:

- 14.1. Timing of when signs will be posted relative to a specific blast
- 14.2. Name and telephone number of person responsible for placing signs
- 14.3. Roadway signs for compliance with Chapter 6, Typical Application 2, of the California MUTCD.

15. Traffic control details for:

- 15.1. Loading and blasting operations
- 15.2. Misfire event or other blast related phenomenon that causes a transportation corridor to remain closed to the public

- 16. Description of possible noxious gas generation and details of safeguards to be used to protect employees, work zones adjacent to the shot, private property, and the public
- 17. Procedure to report and resolve complaints for blast related accidents
- 18. Copies of the Material Safety Data Sheets and manufacturer data sheets of explosives, caps, primers, initiators, and other compounds

Allow 15 days for the Engineer's review of each blasting safety plan. If revisions are needed, you must revise and resubmit the plan. After the plan has been approved by the Engineer, submit 3 additional copies of the approved plan.

MEASUREMENT AND PAYMENT

Rock excavation is measured and paid for by the cubic meter in the same manner as specified for roadway excavation in Sections 19-2.08, "Measurement," and 19-2.09, "Payment," of the Standard Specifications.

Full compensation for preparing and submitting the blasting safety plan is included in the contract price paid per cubic meter for rock excavation and no additional compensation will be allowed therefor.

10-1.67

CONTROLLED LOW STRENGTH MATERIAL:

Controlled low strength material shall consist of a workable mixture of aggregate, cementitious materials, and water and shall conform to the provisions for slurry cement backfill in Section 19-3.062, "Slurry Cement Backfill," of the Standard Specifications and these special provisions.

At the option of the Contractor, controlled low strength material may be used as structure backfill for pipe culverts, except that controlled low strength material shall not be used as structure backfill for culverts having a diameter or span greater than 6.1 m.

When controlled low strength material is used for structure backfill, the width of the excavation shown on the plans may be reduced so that the clear distance between the outside of the pipe and the side of the excavation, on each side of the pipe, is a minimum of

300 mm. This minimum may be reduced to 150 mm when the height of cover is less than or equal to 6.1 m or the pipe diameter or span is less than 1050 mm.

Controlled low strength material in new construction shall not be permanently placed higher than the basement soil. For trenches in existing pavements, permanent placement shall be no higher than the bottom of the existing pavement permeable drainage layer. If a drainage layer does not exist, permanent placement in existing pavements shall be no higher than 25 mm below the bottom of the existing asphalt concrete surfacing or no higher than the top of base below the existing portland cement concrete pavement. The minimum height that controlled low strength material shall be placed, relative to the culvert invert, is 0.5 diameter or 0.5 height for rigid culverts and 0.7 diameter or 0.7 height for flexible culverts.

When controlled low strength material is proposed for use, the Contractor shall submit a mix design and test data to the Engineer for approval prior to excavating the trench for which controlled low strength material is proposed for use. The test data and mix design shall provide for the following:

- A. A 28-day compressive strength between 345 kPa and 690 kPa for pipe culverts having a height of cover of 6.1 m or less and a minimum 28-day compressive strength of 690 kPa for pipe culverts having a height of cover greater than 6.1 m. Compressive strength shall be determined in conformance with the requirements in ASTM Designation: D 4832.
- B. Cement shall be any type of portland cement conforming to the requirements in ASTM Designation: C 150; or any type of blended hydraulic cement conforming to the requirements in ASTM Designation: C 595M or the physical requirements in ASTM Designation: C 1157M. Testing of cement will not be required.
- C. Admixtures may be used in conformance with the provisions in Section 90-4, "Admixtures," of the Standard Specifications. Chemical admixtures containing chlorides as Cl in excess of one percent by mass of admixture, as determined in conformance with the requirements of California Test 415, shall not be used. If an air-entraining admixture is used, the maximum air content shall be limited to 20 percent. Mineral admixtures shall be used at the Contractor's option.

Materials for controlled low strength material shall be thoroughly machine-mixed in a pugmill, rotary drum or other approved mixer. Mixing shall continue until the cementitious material and water are thoroughly dispersed throughout the material. Controlled low strength material shall be placed in the work within 3 hours after introduction of the cement to the aggregates.

When controlled low strength material is to be placed within the traveled way or otherwise to be covered by paving or embankment materials, the material shall achieve a maximum indentation diameter of 76 mm prior to covering and opening to public traffic. Penetration resistance shall be measured in conformance with the requirements in ASTM Designation: D 6024.

Controlled low strength material used as structure backfill for pipe culverts will be considered structure backfill for compensation purposes.

PAYMENT

Full compensation for furnishing and placing controlled low strength material shall be considered as included in the contract prices paid for the items of work that the Contractor prefer to use controlled low strength material as structure backfill for pipe culverts and no separate payment will be made therefor.

10-1.68 SUBGRADE ENHANCEMENT GEOTEXTILE:

GENERAL

Summary

This work includes placing subgrade enhancement geotextile (SEG) between the subgrade and structural section.

Submittals

Submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

MATERIALS

SEG must comply with the specifications for subgrade enhancement geotextile in Section 88-1.08, "Separation and Stabilization," of the Standard Specifications.
SEG must be Class B1.

CONSTRUCTION

Do not use SEG made with polyester within 100 mm of recycled concrete.
Before placement, remove loose or extraneous material and sharp objects that may come in contact with SEG.

Place SEG:

1. In compliance with the manufacturer's recommendations
2. Longitudinally along the roadway alignment
3. Without wrinkles

Overlap adjacent borders of rolls at least 0.60 m. Overlap the ends of rolls at least 2 feet in the direction you spread the material covering SEG.

You may fold or cut SEG to conform to curves. If you cut, overlap at least 450 mm. Hold the overlap in place, choosing from:

1. Staples
2. Pins
3. Piles of material to be placed on the SEG

Do not:

1. Stockpile material on SEG

2. Operate equipment or vehicles directly on SEG
3. Place more SEG than can be covered in 72 hours
4. Compact with a sheepfoot or other non-smooth roller
5. Turn vehicles on material placed directly over SEG

Before operating equipment on material placed over SEG, place 150 mm of material compacted with either a smooth-wheeled roller with no vibrations or a rubber-tired roller. Repair or replace damaged SEG. Repairing consists of placing new SEG with at least 0.90 meter of overlap from the edges of the damaged area.

MEASUREMENT AND PAYMENT

The contract item for subgrade enhancement geotextile is measured by the square meter for the actual area placed. Overlaps are not measured for payment.

The contract price paid per square meter for subgrade enhancement geotextile includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing subgrade enhancement geotextile, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.69

EROSION CONTROL (SEQUENCING):

Place erosion control treatments in the following sequence for each erosion control type identified:

Erosion Control (Type 1)

Rolled Erosion Control Product (Blanket)

Fiber Rolls

Erosion Control (Hydroseed)

Erosion Control (Bonded Fiber Matrix)

Erosion Control (BSM)

ROLLED EROSION CONTROL PRODUCT (BLANKET):**GENERAL****Summary**

This work includes installing rolled erosion control product (blanket).

Definitions

Rolled erosion control product (RECP): A long-term degradable material manufactured or fabricated into rolls designed to reduce soil erosion and assist in the growth, establishment, and protection of vegetation.

Erosion control blanket (ECB): A long-term degradable RECP composed of processed natural fibers mechanically, structurally, or chemically bound together to form a continuous matrix to provide erosion control and vegetation establishment.

Submittals

Submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for:

1. Blanket
2. Fastener

MATERIALS**Blanket**

Blanket must comply with the following:

1. Blanket must be a ECB RECP.
2. Blanket Type: A .
3. Machine-made mat.
4. Minimum width: 72 inches.
5. Physical properties in Table A:

Table A

Type	Number Of Nets	Net Type	Matrix	Maximum "C" Factor ¹	Minimum Sheer Stress ²	Functional Longevity (months)	Minimum Tensile Strength ³
A	Double Net	Organic	70/20% (Straw/Fiber)	0.25	2.0	24	100
B	Double Net	Organic	100% Woven Coir (Coconut Fiber)	0.25	2.25	36	125
C	Double Net	Organic	Wood Excelsior ⁴	0.25	2.0	36	100

Notes:

¹Universal Soil Loss Equation (USLE) C-Factor for a 1.5:1 (H:V) unvegetated slope.

²lb/ft² under ASTM D 6460.

³lb/ft under ASTM D 5035.

⁴80 percent of the fiber 6 inches or longer.

Fasteners

Fasteners must be 11 gauge, 6-inch U-shaped staples with 6-inch legs, and 1-inch crown.

MEASUREMENT AND PAYMENT

The quantity of rolled erosion control product (blanket) will be determined by the square foot from actual slope measurement of the area covered by the rolled erosion control product (blanket) excluding overlaps.

The contract price paid per square meter for rolled erosion control product (blanket) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in rolled erosion control product (blanket), complete in place, including fasteners, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.71 MOVE-IN/MOVE-OUT (EROSION CONTROL):

Move-in/move-out (erosion control) shall include moving onto the project when an area is ready to receive erosion control as determined by the Engineer, setting up all required personnel and equipment for the application of erosion control materials and moving out all personnel and equipment when erosion control in that area is completed.

When areas are ready to receive applications of erosion control (Type BSM), as determined by the Engineer, the Contractor shall begin erosion control work in that area within 5 working days of the Engineer's notification to perform the erosion control work. Attention is directed to the requirements of erosion control (Type BSM) elsewhere in these special provisions.

PAYMENT

Quantities of move-in/move-out (erosion control) will be determined as units from actual count as determined by the Engineer. For measurement purposes, a move-in followed by a move-out will be considered as one unit.

The contract unit price paid for move-in/move-out (erosion control) shall include full compensation for furnishing all labor, materials (excluding erosion control materials), tools, equipment, and incidentals and for doing all the work involved in moving in and removing from the project all personnel and equipment necessary for application of erosion control (Type BSM), as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

No adjustment of compensation will be made for any increase or decrease in the quantities of move-in/move-out (erosion control) required, regardless of the reason for the increase or decrease. The provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications shall not apply to the item of move-in/move-out (erosion control).

10-1.72 **EROSION CONTROL (HYDROSEED):**

GENERAL

Summary

This work includes removing and disposing of weeds, applying erosion control materials, seed, fiber, commercial fertilizer, organic fertilizer, straw, and tackifier to erosion control (Hydroseed) areas shown on the plans.

Comply with Section 20-3, "Erosion Control," of the Standard Specifications.

If the slope on which the erosion control to be placed is finished during the rainy season as specified under "Water Pollution Control" of these special provisions, apply erosion control to the slope immediately.

The Engineer will designate the ground location of all erosion control (Hydroseed) areas in increments of one acre or smaller by directing the placing of stakes or other suitable markers. Furnish all tools, labor, materials, and transportation required to adequately indicate the various erosion control (Hydroseed) locations.

MATERIALS

Seed

Comply with "Erosion Control (Type BFM)" of these special provisions.

Commercial Fertilizer

Comply with "Erosion Control (Type BFM)" of these special provisions.

Straw

Straw must be:

1. Wheat
2. Barley
4. Wheat or Barley

Wheat and barley straw must be derived from irrigated crops.

Straw must be free of plastic, glass, metal, rocks, and refuse or other deleterious material.

Fiber

Comply with "Erosion Control (BFM)" of these special provisions.

Coloring Agent

Use a biodegradable, nontoxic coloring agent free from copper, mercury, and arsenic.

CONSTRUCTION

Site Preparation

Immediately prior to applying seed to erosion control (Hydroseed) areas, trash and debris and weeds must be removed.

Removed weeds must be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Application

Apply erosion control (Hydroseed) materials in separate applications in the following sequence:

1. Apply the following mixture with hydroseeding equipment at the rates indicated within 60 minutes after the seed has been added to the mixture:

Material	Kilograms Per Hectare (Slope Measurement)
Seed	As specified above
Fiber	3,500
Commercial Fertilizer	1,000
Organic Fertilizer	-

2. Apply straw at the rate of **565 kg per hectare** based on slope measurements. Incorporation of straw will not be required. Distribute straw evenly without clumping or piling.

Seed may be dry applied at the total rate specified in the preceding table for small areas not accessible by the hydro-seeding equipment, when approved in writing by the Engineer. Dry applied seed must be incorporated into the soil a maximum depth of 1/4 inch by raking or dragging.

Hydraulic application of erosion control (Hydroseed) materials for rolled erosion control product (Netting) areas must be applied by hose, from the ground. Erosion control (Hydroseed) materials must be applied onto the slope face such that the materials are well integrated into the rolled erosion control product (Netting) and in contact with ground surface. Application must be perpendicular to the slope face such that rolled erosion control product (Netting) materials are not damaged or displaced. Once straw work is started in an area, complete tackifier applications in that area on the same working day. The Engineer may change the rates of erosion control (Hydroseed) materials to meet field conditions.

For any area where erosion control (Hydroseed) materials are to be applied, the application of all erosion control (Hydroseed) materials to be applied to that area must be completed within 72 hours from when the first materials were applied.

MEASUREMENT AND PAYMENT

Erosion control (Hydroseed) will be measured by the square meter. The area will be calculated on the basis of actual or computed slope measurements.

The contract price paid per square meter for erosion control (Hydroseed) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in erosion control (Hydroseed) complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.73

EROSION CONTROL (TYPE BONDED FIBER MATRIX (BFM)):

This work includes applying erosion control materials to embankment and excavation slopes and other areas impacted by construction activities.

Erosion control (Type BFM) must comply Section 20-3, "Erosion Control," of the Standard Specifications.

Before applying erosion control materials, prepare soil surface under Section 19-2.05, "Slopes," of the Standard Specifications except that rills and gullies exceeding 50 mm in depth or width must be leveled. Remove vegetative growth, temporary erosion control materials, and other debris from areas to receive erosion control.

Before applying erosion control materials, the Engineer designates the location of erosion control in increments of 1 hectare or less for smaller areas. Place stakes or other suitable markers at the locations designated by the Engineer. Furnish tools, labor and materials required to designate the various locations.

MATERIALS

Materials must comply with Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Seed

Seed must comply with Section 20-2.10, "Seed," of the Standard Specifications. Seed not required to be labeled under the California Food and Agricultural Code must be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists. Measure and mix individual seed species in the presence of the Engineer. Seed must not contain more than 1.0 percent total weed seed by weight.

Deliver seed to the job site in unopened separate containers with the seed tags attached. A container without a seed tag attached is not accepted. The Engineer takes a sample of approximately 30 g or 60 ml of seed for each seed lot greater than 1 kg. Seed must comply with the following:

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Lotus scoparius (Deerweed)	30	1.0
Lupinus sparsiflorus Loosely Flowered Annual Lupine	35	5.0
Encelia farinosa (Brittlebush)	30	2.0
Eriogonum fasciculatum (California Buckwheat)	40	3.0
Eschscholzia californica (California Poppy)	35	2.0
Gaillardia aristata (Blanketflower)	35	5.0
Hemizonia fasciculata (Fascicled Tarweed)	35	0.5
Vulpia microstachys (Three Weeks Fescue)	35	10

^aSeed produced in CA only.

Seed Sampling Supplies

At the time of seed sampling, furnish individual glassine lined bag and custody seal tag for sealing each seed sample.

Commercial Fertilizer

Commercial fertilizer must comply with Section 20-2.02, "Commercial Fertilizer," of the Standard Specifications and have a guaranteed chemical analysis that falls within the following range:

Ingredient	Percentage Range
Nitrogen	5-8
Phosphoric Acid	3-6
Water Soluble Potash	1-3

Bonded Fiber Matrix

Fiber must comply with Section 20-2.07, "Fiber," of the Standard Specifications and these special provisions. Fiber must be long strand, whole-wood fibers, thermo mechanically processed from clean, whole-wood chips, containing a minimum of 25 percent at 10 mm long, with a minimum of 50 percent retained on a 710 μ m sieve. The wood chips must not contain lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, or chlorine bleach. Fiber must not be produced from sawdust, cardboard, paper, or paper by-products.

Add a coloring agent to the fiber to contrast with the area on which it is applied. The coloring agent must not include copper, mercury, or arsenic and must be biodegradable and nontoxic.

The ratio of fiber to water must be as required to facilitate even application of the material.

Tackifier must be bonded to the fiber or prepackaged with the fiber by the manufacturer. Tackifier must comply with the specifications for stabilizing emulsion under Section 20-2.11 of the Standard Specifications, and be nonflammable, non-toxic to plants and animals and must have no germination or growth inhibiting factors.

The tackifier must be a combination of a cross-linked polymer and an organic, high viscosity colloidal polysaccharide with activating agents or a blended hydrocolloid-based binder. The tackifier, including activating agents and additives, must be a minimum of 10 percent by weight of the fiber. The tackifier must not dissolve or disperse upon rewetting. Before application, submit a Certificate of Compliance for erosion control under Section 6-1.07, "Certificates of Compliance" of the Standard Specifications. The Certificate of Compliance must include a list of pollutant indicators and potential pollutants not visually detectable as described under "Sampling and Analysis Plan for Non-Visible Pollutants" in the Stormwater Pollution Prevention Plan and Water Pollution Control Program Preparation Manual of the Stormwater Quality Handbooks issued by the Department.

APPLICATION

Use hydroseeding equipment to apply erosion control to all disturbed soil surfaces. Apply erosion control from 2 or more directions to avoid shadowing effects forming a continuous mat without gaps between the mat and the soil surface. Apply erosion control in layers to avoid slumping and to aid drying. Unless manufacturer guidelines allow for application during wet weather, apply materials during dry weather with a minimum of 24 hours of dry weather between completion of material application and predicted precipitation. Apply erosion control materials in a single application.

Apply the following mixture at the specified rates within 60 minutes after adding seed to the mixture:

Material	Kilograms Per Hectare ^a (Slope Measurement)
Seed	As specified above
Commercial Fertilizer	1,000
Fiber and Tackifier (Bonded Fiber)	3,100 Slopes <1V:3H
Fiber and Tackifier (Bonded Fiber)	3,500 Slopes >1V:3H and <1V:2H
Fiber and Tackifier (Bonded Fiber)	4,000 Slopes >1V:2H

^aApplication rates of bonded fiber should be increased by 565 kg per hectare for surfaces roughened by techniques such as sheepsfoot-rolled, ripped, tracked, and imprinted.

The ratio of water to fiber and tackifier in the mixture must be as recommended by the manufacturer. The proportions of various erosion control materials may be changed by the Engineer to meet field conditions.

Submit written documentation certifying erosion control was applied in accordance with specified rates, including area of application, time of application, and quantities used.

MAINTENANCE

Reapply erosion control when the area treated exhibits visible erosion. Reapply erosion control within 24 hours of identifying visible erosion, unless otherwise approved by the Engineer.

Monitoring for pollutants not visually detectable in storm water is required by the General Construction NPDES Permit for soil amendments, including soil stabilization products. Repair erosion control damaged during the progress of work resulting from your vehicles, equipment, or operation.

MEASUREMENT AND PAYMENT

The quantity of erosion control (Type BFM) to be paid for will be measured by the square meter as determined from measurements along the slope of the actual areas covered by the erosion control (Type BFM).

The contract price paid per square meter for erosion control (Type BFM) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying erosion control (Type BFM), complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.74 EROSION CONTROL (BSM):

This work includes applying erosion control materials to embankment and excavation slopes and other areas impacted by construction activities.

Erosion control (Biofiltration Swale Mix) must comply Section 20-3, "Erosion Control," of the Standard Specifications.

If the slope on which the erosion control is to be placed is finished during the rainy season as specified in "Water Pollution Control" of these special provisions, immediately apply erosion control to the slope.

Before applying erosion control materials, prepare soil surface under Section 19-2.05, "Slopes," of the Standard Specifications except that rills and gullies exceeding 50 mm in depth or width must be leveled. Remove vegetative growth, temporary erosion control materials, and other debris from areas to receive erosion control.

Before applying erosion control materials, the Engineer designates the location of erosion control in increments of 1 hectare or less for smaller areas. Place stakes or other suitable markers at the locations designated by the Engineer. Furnish tools, labor and materials required to designate the various locations.

MATERIALS

Materials must comply with Section 20-2, "Materials," of the Standard Specifications and these special provisions.

Seed

Seed must comply with Section 20-2.10, "Seed," of the Standard Specifications. Seed not required to be labeled under the California Food and Agricultural Code must be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists. Measure and mix individual seed species in the presence of the Engineer. Seed must not contain more than 1.0 percent total weed seed by weight.

Deliver seed to the job site in unopened separate containers with the seed tags attached. A container without a seed tag attached is not accepted. The Engineer takes a sample of approximately 30 g or 60 ml of seed for each seed lot greater than 1 kg.

Seed must comply with the following:

Botanical Name (Common Name)	Percent Germination (Minimum)	Kilograms Pure Live Seed Per Hectare (Slope Measurement)
Elymus Condenstatus (Giant Wild Rye)	30	1.0
Stipa Lepida (Foothill Stipa)	35	5.0
Eschoscholzia California (California Poppy)	35	2.0
Vulpia Microstachys (Small Fescue)	35	10

^aSeed produced in CA only.

Seed Sampling Supplies

At the time of seed sampling, furnish individual glassine lined bag and custody seal tag for sealing each seed sample.

Commercial Fertilizer

Commercial fertilizer must comply with Section 20-2.02, "Commercial Fertilizer," of the Standard Specifications and have a guaranteed chemical analysis that falls within the following range:

Ingredient	Percentage Range
Nitrogen	5-8
Phosphoric Acid	3-6
Water Soluble Potash	1-3

Bonded Fiber Matrix

Fiber must comply with Section 20-2.07, "Fiber," of the Standard Specifications and these special provisions. Fiber must be long strand, whole-wood fibers, thermo mechanically processed from clean, whole-wood chips, containing a minimum of 25 percent at 10 mm long, with a minimum of 50 percent retained on a 710 μ m sieve. The wood chips must not contain lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, or chlorine bleach. Fiber must not be produced from sawdust, cardboard, paper, or paper by-products.

Add a coloring agent to the fiber to contrast with the area on which it is applied. The coloring agent must not include copper, mercury, or arsenic and must be biodegradable and nontoxic.

The ratio of fiber to water must be as required to facilitate even application of the material. Tackifier must be bonded to the fiber or prepackaged with the fiber by the manufacturer. Tackifier must comply with the specifications for stabilizing emulsion under Section 20-2.11 of the Standard Specifications, and be nonflammable, non-toxic to plants and animals and must have no germination or growth inhibiting factors.

The tackifier must be a combination of a cross-linked polymer and an organic, high viscosity colloidal polysaccharide with activating agents or a blended hydrocolloid-based binder. The tackifier, including activating agents and additives, must be a minimum of 10 percent by weight of the fiber. The tackifier must not dissolve or disperse upon rewetting. Before application, submit a Certificate of Compliance for erosion control under Section 6-1.07, "Certificates of Compliance" of the Standard Specifications. The Certificate of Compliance must include a list of pollutant indicators and potential pollutants not visually detectable as described under "Sampling and Analysis Plan for Non-Visible Pollutants" in the Stormwater Pollution Prevention Plan and Water Pollution Control Program Preparation Manual of the Stormwater Quality Handbooks issued by the Department.

APPLICATION

Use hydroseeding equipment to apply erosion control to all disturbed soil surfaces. Apply erosion control from 2 or more directions to avoid shadowing effects forming a continuous mat without gaps between the mat and the soil surface. Apply erosion control in layers to avoid slumping and to aid drying. Unless manufacturer guidelines allow for application during wet weather, apply materials during dry weather with a minimum of 24 hours of dry weather between completion of material application and predicted precipitation. Apply erosion control materials in a single application.

Apply the following mixture at the specified rates within 60 minutes after adding seed to the mixture:

Material	Kilograms Per Hectare ^a (Slope Measurement)
Seed	18
Commercial Fertilizer	1,000
Fiber and Tackifier (Bonded Fiber)	3,100 Slopes <1V:3H
Fiber and Tackifier (Bonded Fiber)	3,500 Slopes >1V:3H and <1V:2H
Fiber and Tackifier (Bonded Fiber)	4,000 Slopes >1V:2H

^aApplication rates of bonded fiber should be increased by 565 kg per hectare for surfaces roughened by techniques such as sheepsfoot-rolled, ripped, tracked, and imprinted.

The ratio of water to fiber and tackifier in the mixture must be as recommended by the manufacturer. The proportions of various erosion control materials may be changed by the Engineer to meet field conditions.

Submit written documentation certifying erosion control was applied in accordance with specified rates, including area of application, time of application, and quantities used.

MAINTENANCE

Reapply erosion control when the area treated exhibits visible erosion. Reapply erosion control within 24 hours of identifying visible erosion, unless otherwise approved by the Engineer.

Monitoring for pollutants not visually detectable in storm water is required by the General Construction NPDES Permit for soil amendments, including soil stabilization products. Repair erosion control damaged during the progress of work resulting from your vehicles, equipment, or operation.

MEASUREMENT AND PAYMENT

The quantity of erosion control (BSM) to be paid for will be measured by the square meter as determined from measurements along the slope of the actual areas covered by the erosion control (BSM).

The contract price paid per square meter for erosion control (Biofiltration Swale Mix) includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying erosion control (Biofiltration Swale Mix), complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.75

FIBER ROLLS:

Fiber rolls shall be furnished and installed in conformance with details shown on the plans and these special provisions and as directed by the Engineer.

Fiber rolls shall be installed on excavation and embankment slopes and other disturbed soil areas.

At the option of the Contractor, fiber rolls shall be Type 1 or Type 2.

MATERIALS

Fiber Roll

Fiber roll shall be either:

1. Constructed with a premanufactured blanket consisting of either wood excelsior, rice or wheat straw, or coconut fibers or a combination of these materials. The blanket shall be between 2.0 m and 2.4 m in width and between 20 m and 29 m in length. Wood excelsior shall be individual fibers, of which 80 percent shall be 150 mm or longer in length. The blanket shall have a biodegradable jute, sisal, or coir fiber netting on at least one side. The blanket shall be rolled along the width and secured with jute twine spaced 2 m apart along the full length of the roll and placed 150 mm from the ends of each roll. The finished roll shall be between 200 mm and 250 mm in diameter, a minimum of 6 m in length, and shall weigh at least 0.81-kg/m. More than one blanket may be required to

- achieve the finished roll diameter. When more than one blanket is required, blankets shall be jointed longitudinally with an overlap of 150 mm along the length of the blanket.
2. A premanufactured roll of rice or wheat straw, wood excelsior, or coconut fiber encapsulated within a biodegradable jute, sisal, or coir fiber netting. The netting shall have a minimum durability of one year after installation. The netting shall be secured tightly at each end of the roll. Rolls shall be between 200 mm and 300 mm in diameter. Rolls between 200 mm and 250 mm in diameter shall have a minimum weight of 1.6 kg/m and a minimum length of 6 m. Rolls between 250 mm and 300 mm in diameter shall have a minimum weight of 4.5 kg/m and a minimum length of 3 m.

Stakes

Wood stakes shall be a minimum of 19 mm x 19 mm x 450 mm in size for Type 1 installation, or a minimum of 19 mm x 38 mm x 450 mm in size for Type 2 installation. Wood stakes shall be untreated fir, redwood, cedar, or pine and cut from sound timber. They shall be straight and free of loose or unsound knots and other defects which would render them unfit for the purpose intended. Metal stakes shall not be used.

Rope

Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 6.35 mm.

INSTALLATION

Fiber rolls shall be installed as follows:

1. Fiber rolls (Type 1): Furrows shall be constructed to a depth between 50 mm and 100 mm, and to a sufficient width to hold the fiber roll. Stakes shall be installed 600 mm apart along the length of the fiber rolls and stopped at 300 mm from each end of the rolls. Stakes shall be driven to a maximum of 50 mm above, or flush with the top of the roll.
2. Fiber rolls (Type 2): Rope and notched stakes shall be used to restrain the fiber rolls against the slope. Stakes shall be driven into the slope until the notch is even with the top of the fiber roll. Rope shall be knotted at each stake and laced between stakes. After installation of the rope, stakes shall be driven into the slope such that the rope will hold the fiber roll tightly to the slope. Furrows will not be required.
3. Fiber rolls shall be placed 3 m apart along the slope for slope inclination (vertical:horizontal) of 1:2 and steeper, 4.5 m apart along the slope for slope inclination between 1:2 and 1:4, 6.0 m apart along the slope for slope inclination between 1:4 and 1:10, and a maximum of 15 m apart along the slope for slope inclination of 1:10 and flatter.
4. The bedding area for the fiber rolls shall be cleared of obstructions including rocks, clods, and debris greater than 25 mm in diameter before installation.
5. Fiber rolls shall be installed approximately parallel to the slope contour.
6. Fiber rolls shall be installed before the application of other erosion control or soil stabilization materials in the same area.

If the intended function of the fiber rolls to disperse concentrated water runoff and to reduce runoff velocities is impaired, the Contractor shall take action to repair or replace the fiber rolls. Split, torn, or unraveling rolls shall be repaired or replaced. Broken or split stakes shall be replaced. Sagging or slumping fiber rolls shall be repaired with additional stakes or replaced. Locations where rills and other evidence of concentrated runoff have occurred

beneath the rolls shall be corrected. Fiber rolls shall be repaired or replaced within 24 hours of identifying the deficiency.

MEASUREMENT AND PAYMENT

Quantities of fiber rolls to be paid for will be determined by the meter measured along the centerline of the installed roll. Where fiber rolls are joined and overlapped, the overlap will be measured as a single installed roll.

The contract price paid per meter for fiber roll shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing fiber rolls, complete in place, including furrow excavation and backfill, repairing or replacing fiber rolls as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

Damage to fiber rolls resulting from the Contractor's vehicles, equipment, or operations shall be repaired at the Contractor's expense.

10-1.76 AGGREGATE BASE:

Aggregate base must comply with Section 26, "Aggregate Bases," of the Standard Specifications and these special provisions.

Aggregate base must be Class 2.

Do not store reclaimed asphalt concrete or aggregate base with reclaimed asphalt concrete within 30 m measured horizontally of any culvert, watercourse, or bridge.

PAYMENT

Quantities of aggregate base will be paid for at the contract price per cubic meter, and in accordance with the provisions of Sections 26-1.06 and 26-1.07 of the Standard Specifications.

10-1.77 HOT MIX ASPHALT:

GENERAL

Summary

This work includes producing and placing hot mix asphalt (HMA) Type A using the Quality Control / Quality Assurance process.

Comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications.

Submittals

Quality Control / Quality Assurance Projects

With the job mix formula (JMF) submittal, submit:

1. California Test 204 plasticity index results

2. California Test 371 tensile strength ratio results for untreated HMA
3. California Test 371 tensile strength ratio results for treated HMA if untreated HMA tensile strength ratio is below 70

At project start-up and once during production, submit samples split from your HMA production sample for California Test 371 to the Engineer and the Transportation Laboratory, Attention: Moisture Test.

With the JMF submittal, at project start-up, and each 5000 tonnes, submit the California Test 371 test results for mix design and production to the Engineer and electronically to:

Moisture_Tests@dot.ca.gov

Data Cores

Three business days before starting coring, submit proposed methods and materials for backfilling data core holes.

Submit to the Engineer and electronically to Coring@dot.ca.gov:

1. A summary of data cores taken
2. A photograph of each data core

For each data core, the summary must include:

1. Project identification number
2. Date cored
3. Core identification number
4. Type of materials recovered
5. Type and approximate thickness of unstabilized material not recovered
6. Total core thickness
7. Thickness of each individual material to within:

- 7.1 For recovered material, 12.5 mm
- 7.2 For unstabilized material, 25 mm

8. Location including:

- 8.1. County
- 8.2. Route
- 8.3. Post mile
- 8.4. Lane number
- 8.5. Lane direction
- 8.6. Station

Each data core digital photograph must include a ruler laid next to the data core. Each photograph must include:

1. The core
2. Project identification number
3. Core identification number

4. Date cored
5. County
6. Route
7. Post mile
8. Lane number
9. Lane direction

After data core summary and photograph submittal, dispose of cores under Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Quality Control and Assurance

Quality Control / Quality Assurance Projects

For the mix design, determine the plasticity index of the aggregate blend under California Test 371. Choose an antistrip treatment and use the corresponding laboratory procedure for the mix design in compliance with:

Antistrip Treatment Lab Procedures for Mix Design

Antistrip Treatment	Lab Procedure
Plasticity index from 4 to 10 ^a	
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7
Plasticity index less than 4	
Liquid	LP-5
Dry hydrated lime without marination	LP-6
Dry hydrated lime with marination	LP-6
Lime slurry with marination	LP-7

Notes:

^a If the plasticity index is greater than 10, do not use that aggregate blend.

For the mix design, determine tensile strength ratio under California Test 371 on untreated HMA. If the tensile strength ratio is less than 70:

1. Choose from the antistrip treatments specified based on plasticity index.
2. Test treated HMA under California Test 371.
3. Treat to a minimum tensile strength ratio of 70.

On the first production day and at least every 5000 tonnes, sample HMA and test under California Test 371.

The Department does not use California Test 371 test results for JMF verification and production to determine specification compliance.

MATERIALS

Asphalt Binder

The grade of asphalt binder mixed with aggregate for HMA Type A must be PG 64-10.

Aggregate

Specified Total Thickness Range	Grading
25 mm – 35 mm	9.5-mm
35 mm – 60 mm	12.5-mm
60 mm and above	19-mm

The aggregate for HMA Type A must comply with the 19.5-mm grading.

CONSTRUCTION

Vertical Joints

Before opening the lane to public traffic, pave shoulders and median borders adjacent to a lane being paved.

Do not leave a vertical joint more than 45 mm high between adjacent lanes open to public traffic.

Place HMA on adjacent traveled way lanes so that at the end of each work shift, the distance between the ends of HMA layers on adjacent lanes is between 1.5 m and 3.0 m. Place additional HMA along the transverse edge at each lane's end and along the exposed longitudinal edges between adjacent lanes. Hand rake and compact the additional HMA to form temporary conforms. You may place Kraft paper or another approved bond breaker under the conform tapers to facilitate the taper removal when paving operations resume.

Widening

If widening existing pavement, construct new structural section on both sides of the existing pavement to match the elevation of the existing pavement's edge at each location before placing HMA over the existing pavement.

Data Cores

Take data cores that include the completed HMA pavement, underlying base, and subbase material. Protect data cores and surrounding pavement from damage.

Take 100-mm or 150-mm diameter data cores:

1. At the beginning, end, and every 800 m within the paving limits of each route on the project
2. After all paving is complete
3. From the center of the specified lane

On a 2-lane roadway, take data cores from either lane. On a 4-lane roadway, take data cores from each direction in the outermost lane. On a roadway with more than 4 lanes, take data cores from the median lane and the outermost lane in each direction.

Each core must include the stabilized materials encountered. You may choose not to recover unstabilized material but you must identify the material. Unstabilized material includes:

1. Granular material
2. Crumbled or cracked stabilized material
3. Sandy or clayey soil

PAYMENT

Hot mix asphalt (Type A) will be measured and paid for by the tonne as provided in Section 39-5, "Measurement and Payment," of the Standard Specifications.

Placing asphalt concrete dikes will be measured and paid for by the meter as provided in Section 39-5, "Measurement and Payment," of the Standard Specifications.

Full compensation for paint binder (tack coat), shall be considered as included in the contract prices paid for the various items of work involving paint binder (tack coat) and no separate payment will be made therefore.

Full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in data coring, shall be considered as included in the contract price paid per tonne for Hot Mix Asphalt (Type A) and no additional compensation will be allowed therefor.

10-1.78 HOT MIX ASPHALT (MISCELLANEOUS AREAS):

GENERAL

Summary

This work includes producing hot mix asphalt (HMA) and placing it on miscellaneous areas.

Comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications.

MEASUREMENT AND PAYMENT

If there is a contract item for place hot mix asphalt (miscellaneous area) paid for by the square meter, this item is limited to the areas listed on the plans and is in addition to the contract items for the materials involved.

Placing asphalt concrete (Miscellaneous Area) will be measured and paid for by the square meter as provided in Section 39-5, "Measurement and Payment," of the Standard Specifications.

10-1.79 MINOR HOT MIX ASPHALT:

GENERAL

Summary

This work includes producing hot mix asphalt (HMA) at a central mixing plant and placing it as specified in "Cold Plane Asphalt Concrete Pavement" of these special provisions.

MATERIALS

For minor HMA:

1. Do not submit a job mix formula.

2. Choose the 9.5-mm or 12.5-mm HMA Type A or Type B aggregate gradation under Section 39-1.02E, "Aggregate," of the Standard Specifications.
3. Minimum asphalt binder content must be 6.8 percent for 9.5-mm aggregate gradation and 6.0 percent for 12.5-mm aggregate gradation.
4. Choose asphalt binder Grade PG 64-10, PG 64-16, or PG 70-10 under Section 92, "Asphalts," of the Standard Specifications.

If you request and the Engineer authorizes, you may reduce the minimum asphalt binder content.

Tack coat must comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications.

CONSTRUCTION

Spread and compact minor HMA by methods that produce an HMA surfacing:

1. Textured uniformly
2. Compacted firmly
3. Without depressions, humps, and irregularities

Using a self-propelled spreader, spread minor HMA ready for compacting without further shaping.

Compact minor HMA with a vibratory roller providing a minimum of 31 kilonewtons centrifugal force. With the vibrator on, compact at least 3 complete coverages over each layer, overlapping to prevent displacement. The speed of the vibratory roller in km per hour must not exceed the vibrations per minute divided by 1600. If the HMA layer thickness is less than 25 mm, turn the vibrator off. Complete the first coverage before the mixture's temperature drops below 120 °C.

Minor HMA finished surface must be:

1. Textured uniformly
2. Compacted firmly
3. Without depressions, humps, and irregularities
4. Compliant with the 3.66 m straightedge specifications in Section 39-1.12, "Smoothness," of the Standard Specifications

MEASUREMENT AND PAYMENT

Full compensation for minor hot mix asphalt, including paint binder (tack coat), shall be considered as included in the contract price paid per square meter for cold plane asphalt concrete pavement and no separate payment will be made therefore.

HOT MIX ASPHALT AGGREGATE LIME TREATMENT - SLURRY METHOD:**GENERAL****Summary**

This work includes treating hot mix asphalt (HMA) aggregate with lime using the slurry method and placing it in stockpiles to marinate.

Treat aggregate for HMA Type A with lime slurry.

Submittals

Determine the exact lime proportions for fine and coarse virgin aggregate and submit them as part of the proposed job mix formula (JMF) under Section 39, "Hot Mix Asphalt," of the Standard Specifications.

Submit the averaged aggregate quality test results to the Engineer within 24 hours of sampling.

Submit a treatment data log from the slurry proportioning device in the following order:

1. Treatment date
2. Time of day the data is captured
3. Aggregate size being treated
4. Wet aggregate flow rate collected directly from the aggregate weigh belt
5. Moisture content of the aggregate just before treatment, expressed as a percent of the dry aggregate mass
6. Dry aggregate flow rate calculated from the wet aggregate flow rate
7. Lime slurry flow rate measured by the slurry meter
8. Dry lime flow rate calculated from the slurry meter output
9. Approved lime ratio for each aggregate size being treated
10. Actual lime ratio calculated from the aggregate weigh belt and the slurry meter output, expressed as a percent of the dry aggregate mass
11. Calculated difference between the approved lime ratio and the actual lime ratio
12. Dry lime and water proportions at the slurry treatment time

Every day during lime treatment, submit the treatment data log on electronic media in tab delimited format on a removable CD-ROM storage disk. Each continuous treatment data set must be a separate record using a line feed carriage return to present the specified data on one line. The reported data must include data titles at least once per report.

Quality Control and Assurance

Your quality control plan (QCP) must include aggregate quality control sampling and testing during aggregate lime treatment. Perform sampling and testing in compliance with:

Aggregate Quality Control During Lime Treatment

Quality Characteristic	Test Method	Minimum sampling and testing frequency
Sand Equivalent	CT 217	Once per 1 000 tonnes of aggregate treated with lime
Percent of crushed particles	CT 205	As necessary and as designated in the QCP
Los Angeles Rattler	CT 211	
Fine aggregate angularity	AASHTO T 304, Method A	
Flat and elongated particles	ASTM D 4791	

Note:

During lime treatment, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Run tests for aggregate quality in triplicate and report test results as the average of 3 tests.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit the treatment data log.
2. Do not submit the aggregate quality control data.
3. Submit incomplete, untimely, or incorrectly formatted data.
4. Do not take corrective actions.
5. Take late or unsuccessful corrective actions.
6. Do not stop treatment when proportioning tolerances are exceeded.
7. Use malfunctioning or failed proportioning devices.

If you stop treatment, notify the Engineer of any corrective actions taken and conduct a successful 20-minute test run before resuming treatment.

For the aggregate to be treated, determine the moisture content at least once during each 2 hours of treatment. Calculate moisture content under California Test 226 or California Test 370 and report it as a percent of dry aggregate mass. Use the moisture content calculations as a set point for the proportioning process controller.

MATERIALS

High-calcium hydrated lime and water must comply with Section 24-1.02, "Materials," of the Standard Specifications.

Before virgin aggregate is treated, it must comply with the aggregate quality specifications. Do not test treated aggregate for quality control except for gradation. The Engineer does not test treated aggregate for acceptance except for gradation. If reclaimed asphalt pavement (RAP) is used, the Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.

The Engineer determines the combined aggregate gradation during HMA production after you have treated aggregate.

Treated aggregate must not have lime balls or clods.

CONSTRUCTION

General

Notify the Engineer at least 24 hours before the start of aggregate treatment.

Treat aggregate separate from HMA production.

Do not treat RAP.

Add lime to the aggregate as slurry consisting of mixed dry lime and water at a ratio of 1 part lime to between 2 parts and 3 parts water by mass. The slurry must completely coat the aggregate.

Lime treat and marinate coarse and fine aggregates separately.

Immediately before mixing lime slurry with aggregate, water must not visibly separate from aggregate.

Treat aggregate and stockpile for marination only once.

The lime ratio is the kilograms of dry hydrated lime per 100 kg of dry virgin aggregate expressed as a percent. Water content of slurry or untreated aggregate must not affect the lime ratio.

Lime ratio ranges are:

Aggregate Gradation	Lime Ratio
Coarse	0.4 to 1.0
Fine	1.5 to 2.0
Combined virgin aggregate	0.8 to 1.5

The lime ratio for fine and coarse aggregate must be within ± 0.2 percent of the lime ratio in the accepted JMF. The lime ratio must be within ± 0.2 percent of the approved lime ratio when you combine the individual aggregate sizes in the JMF proportions. Determine the lime ratio before adding RAP.

If 3 consecutive sets of recorded treatment data indicate deviation more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment.

If a set of recorded treatment data indicates a deviation of more than 0.4 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the material represented by that set of data in HMA.

If 20 percent or more of the total daily treatment indicates deviation of more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the day's total treatment in HMA.

If you stop treatment for noncompliance, you must implement corrective action and successfully treat aggregate for a 20-minute period. Notify the Engineer before beginning the 20-minute treatment period.

Lime Slurry Proportioning

Proportion lime and water with a continuous or batch operation.

The device controlling slurry proportioning must produce a treatment data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily treatment. The data must be a treatment activity register and not a summation. The material represented by the data set is the amount produced 5 minutes before and 5 minutes after the capture time. For the contract's duration, collected data must be stored by the controller.

Proportioning and Mixing Lime Slurry Treated Aggregate

Treat HMA aggregate by proportioning lime slurry and aggregate by mass in a continuous operation.

Marinate treated aggregate in stockpiles from 24 hours to 60 days before using in HMA. Do not use aggregate marinated longer than 60 days.

MEASUREMENT AND PAYMENT

Full compensation for treating aggregates with lime slurry shall be considered as included in the contract price paid per tonne for HMA as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.81

HOT MIX ASPHALT AGGREGATE LIME TREATMENT - DRY LIME METHOD:

GENERAL

Summary

This work includes treating hot mix asphalt (HMA) aggregate with lime using the dry lime method either with marination or without.

Treat aggregate for HMA Type A with dry lime.

Marinate aggregate if the plasticity index determined under California Test 204 is from 4 to 10.

Submittals

Determine the exact lime proportions for fine and coarse virgin aggregate and submit them as part of the proposed job mix formula (JMF) under Section 39, "Hot Mix Asphalt," of the Standard Specifications.

If marination is required, submit in writing the averaged aggregate quality test results to the Engineer within 24 hours of sampling.

Submit in writing a treatment data log from the dry lime and aggregate proportioning device in the following order:

1. Treatment date
2. Time of day the data is captured
3. Aggregate size being treated

4. HMA type and mix aggregate size
5. Wet aggregate flow rate collected directly from the aggregate weigh belt
6. Aggregate moisture content, expressed as a percent of the dry aggregate mass
7. Flow rate of dry aggregate calculated from the flow rate of wet aggregate
8. Dry lime flow rate
9. Lime ratio from the accepted JMF for each aggregate size being treated
10. Lime ratio from the accepted JMF for the combined aggregate
11. Actual lime ratio calculated from the aggregate weigh belt output, the aggregate moisture input, and the dry lime meter output, expressed as a percent of the dry aggregate mass
12. Calculated difference between the approved lime ratio and the actual lime ratio

Every day during lime treatment, submit the treatment data log on electronic media in tab delimited format on a removable CD-ROM storage disk. Each continuous treatment data set must be a separate record using a line feed carriage return to present the specified data on one line. The reported data must include data titles at least once per report.

Quality Control and Assurance

If marination is required, the quality control plan (QCP) specified in Section 39-4, "Quality Control / Quality Assurance," must include aggregate quality control sampling and testing during lime treatment. Perform sampling and testing in compliance with:

Quality Characteristic	Test Method	Minimum sampling and testing frequency
Sand Equivalent	CT 217	Once per 1 000 tonnes of aggregate treated with lime
Percent of crushed particles	CT 205	As necessary and as designated in the QCP
Los Angeles Rattler	CT 211	
Fine aggregate angularity	AASHTO T 304, Method A	
Flat and elongated particles	ASTM D 4791	

Note: During lime treatment, sample coarse and fine aggregate from individual stockpiles. Combine aggregate in the JMF proportions. Run tests for aggregate quality in triplicate and report test results as the average of 3 tests.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit the treatment data log
2. Do not submit the aggregate quality control data for marinated aggregate
3. Submit incomplete, untimely, or incorrectly formatted data
4. Do not take corrective actions
5. Take late or unsuccessful corrective actions
6. Do not stop treatment when proportioning tolerances are exceeded
7. Use malfunctioning or failed proportioning devices

If you stop treatment, notify the Engineer of any corrective actions taken and conduct a successful 20-minute test run before resuming treatment.

MATERIALS

Lime must be high-calcium hydrated lime. Lime and water must comply with Section 24-1.02, "Materials," of the Standard Specifications.

Before virgin aggregate is treated, it must comply with the aggregate quality specifications. Do not test treated aggregate for quality control except for gradation. The Engineer does not test treated aggregate for acceptance except for gradation.

The Engineer determines the combined aggregate gradation during HMA production after you have treated aggregate. If reclaimed asphalt pavement (RAP) is used, the Engineer determines combined aggregate gradations containing RAP under Laboratory Procedure LP-9.

Treated aggregate must not have lime balls or clods.

CONSTRUCTION

General

Notify the Engineer in writing at least 24 hours before the start of aggregate treatment.

Do not treat RAP.

If marination is required:

1. Treat and marinate coarse and fine aggregates separately.
2. Treat aggregate and stockpile for marination only once.
3. Treat aggregate separate from HMA production.

The lime ratio is the kilograms of dry hydrated lime per 100 kg of dry virgin aggregate expressed as a percent. Water content of untreated aggregate must not affect the lime ratio.

Lime ratio ranges are:

Aggregate Gradation	Lime Ratio
Coarse	0.4 to 1.0
Fine	1.5 to 2.0
Combined virgin aggregate	0.8 to 1.5

The lime ratio for fine and coarse aggregate must be within ± 0.2 percent of the lime ratio in the accepted JMF. The lime ratio must be within ± 0.2 percent of the approved lime ratio when you combine the individual aggregate sizes in the JMF proportions. Determine the lime ratio before adding of RAP.

Proportion dry lime by mass with a continuous operation.

The device controlling dry lime and aggregate proportioning must produce a treatment data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily treatment. The data must be a treatment activity register and not a summation. The material represented by a data set is the amount produced 5 minutes before and 5 minutes after the capture time. For the duration of the contract, collected data must be stored by the controller.

If 3 consecutive sets of recorded treatment data indicate deviation more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment of lime treated aggregates.

If a set of recorded treatment data indicates a deviation of more than 0.4 percent above or below the lime ratio in the accepted JMF, stop treatment of lime treated aggregates and do not use the material represented by that set of data in HMA.

If 20 percent or more of the total daily treatment indicates deviation of more than 0.2 percent above or below the lime ratio in the accepted JMF, stop treatment and do not use the day's treated aggregate in HMA.

If you stop treatment for noncompliance, you must implement corrective action and successfully treat aggregate for a 20-minute period. Notify the Engineer before beginning the 20-minute treatment period.

If you use a batch-type proportioning operation for HMA production, control proportioning in compliance with the specifications for continuous mixing plants. Use a separate dry lime aggregate treatment operation from HMA batching operations including:

1. Pugmill raixer
2. Controller
3. Weigh belt for the lime
4. Weigh belt for the aggregate

If using a continuous mixing operation for HMA without lime marinated aggregates, use a controller that measures the blended aggregate mass after any additional water is added to the mixture. The controller must determine the amount of lime added to the aggregate from the aggregate weigh belt input in connection with the manually input total aggregate moisture, the manually input target lime content, and the lime proportioning system output. Use a continuous aggregate weigh belt and pugmill mixer for the lime treatment operation in addition to the weigh belt for the aggregate proportioning to asphalt binder in the HMA plant. If you use a water meter for moisture control for lime treatment, the meter must comply with California Test 109.

At the time of mixing dry lime with aggregate, the aggregate moisture content must ensure complete lime coating. The aggregate moisture content must not cause aggregate to be lost between the point of weighing the combined aggregate continuous stream and the dryer. Add water for mixing and coating aggregate to the aggregate before dry lime addition. Immediately before mixing lime with aggregate, water must not visibly separate from aggregate.

The HMA plant must be equipped with a bag house dust system. Material collected in the dust system must be returned to the mix.

Mixing Dry Lime and Aggregate

Mix aggregate, water, and dry lime with a continuous pugmill mixer with twin shafts. Immediately before mixing lime with aggregate, water must not visibly separate from

aggregate. Store dry lime in a uniform and free flowing condition. Introduce dry lime to the pugmill in a continuous operation. The introduction must occur after the aggregate cold feed and before the point of proportioning across a weigh belt and the aggregate dryer. Prevent loss of dry lime.

If marination is required, marinate treated aggregate in stockpiles between 24 hours and 60 days before using in HMA. Do not use aggregate marinated more than 60 days. The pugmill must be equipped with paddles arranged to provide sufficient mixing action and mixture movement. The pugmill must produce a homogeneous mixture of uniformly coated aggregates at mixer discharge.

If the aggregate treatment operation is stopped longer than 1 hour, clean the equipment of partially treated aggregate and lime.

Aggregate must be completely treated before introduction into the mixing drum.

MEASUREMENT AND PAYMENT

Full compensation for dry lime treating HMA aggregate including marination shall be considered as included in the contract price paid per tonne for HMA as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.82 LIQUID ANTISTRIP TREATMENT:

GENERAL

Summary

This work includes treating asphalt binder with liquid antistrip (LAS) treatment to bond the asphalt binder to aggregate in hot mix asphalt (HMA).

Submittals

For LAS, submit with the proposed job mix formula (JMF) submittal under Section 39, "Hot Mix Asphalt," of the Standard Specifications:

1. Materials Safety Data Sheet (MSDS)
2. One 1/2-L sample
3. Infrared analysis including copy of absorption spectra

Submit a certified copy of test results and a MSDS for each LAS lot.

Submit a Certificate of Compliance under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each LAS shipment. With each certificate also submit:

1. Your signature and printed name
2. Shipment number
3. Material type
4. Material specific gravity

5. Refinery
6. Consignee
7. Destination
8. Quantity
9. Contact or purchase order number
10. Shipment Date

Submit proportions for LAS as part of the JMF submittal specified in Section 39-1.03, "Hot Mix Asphalt Mix Design Requirements," of the Standard Specifications. If you change the brand or type of LAS, submit a new JMF.

For each job site delivery of LAS, submit one 1/4-L sample to the Transportation Laboratory. Submit shipping documents to the Engineer. Label each LAS sampling container with:

1. LAS type
2. Application rate
3. Sample date
4. Contract number

At the end of each day's production shift, submit production data in electronic and printed media. Present data on electronic media in tab delimited format. Use line feed carriage return with one separate record per line for each production data set. Allow sufficient fields for the specified data. Include data titles at least once per report. For each mixing operation type, submit in order:

1. Batch Mixing:
 - 1.1. Production date
 - 1.2. Time of batch completion
 - 1.3. Mix size and type
 - 1.4. Each ingredient's mass
 - 1.5. Asphalt binder content as percentage of dry aggregate mass
 - 1.6. LAS content as percentage of asphalt binder mass
2. Continuous Mixing:
 - 2.1. Production date
 - 2.2. Data capture time
 - 2.3. Mix size and type
 - 2.4. Flow rate of wet aggregate collected directly from the aggregate weigh belt
 - 2.5. Aggregate moisture content as percentage of dry aggregate mass
 - 2.6. Flow rate of asphalt binder collected from the asphalt binder meter
 - 2.7. Flow rate of LAS collected from the LAS meter
 - 2.8. Asphalt binder content as percentage of dry aggregate mass calculated from:
 - 2.8.1. Aggregate weigh belt output
 - 2.8.2. Aggregate moisture input
 - 2.8.3. Asphalt binder meter output

2.9. LAS content as percentage of asphalt binder mass calculated from:

2.9.1. Asphalt binder meter output

2.9.2. LAS meter output

Quality Control and Assurance

For continuous mixing and batch mixing operations, sample asphalt binder before adding LAS. For continuous mixing operations, sample combined asphalt binder and LAS after the static mixer.

The Engineer orders proportioning operations stopped for any of the following if you:

1. Do not submit data
2. Submit incomplete, untimely, or incorrectly formatted data
3. Do not take corrective actions
4. Take late or unsuccessful corrective actions
5. Do not stop production when proportioning tolerances are exceeded
6. Use malfunctioning or failed proportioning devices

If you stop production, notify the Engineer of any corrective actions taken before resuming.

MATERIALS

LAS-treated asphalt binder must comply with Section 39, "Hot Mix Asphalt," of the Standard Specifications. LAS does not substitute for asphalt binder.

LAS total amine value must be 325 minimum when tested under ASTM D 2074.

Use only 1 LAS type or brand at a time. Do not mix LAS types or brands.

Store and mix LAS under the manufacturer's recommendations.

CONSTRUCTION

LAS must be between 0.5 and 1.0 percent by mass of asphalt binder.

If 3 consecutive sets of recorded production data show actual delivered LAS mass is more than ± 1 percent of the approved mix design LAS weight, stop production and take corrective action.

If a set of recorded production data shows actual delivered LAS mass is more than ± 2 percent of the approved mix design LAS weight, stop production. If the LAS mass exceeds 1.2 percent of the asphalt binder mass, do not use the HMA represented by that data.

The continuous mixing plant controller proportioning the HMA must produce a production data log. The log consists of a series of data sets captured at 10-minute intervals throughout daily production. The data must be a production activity register and not a summation. The material represented by the data is the amount produced 5 minutes before and 5 minutes after the capture time. For the duration of the contract, collected data must be stored by the plant controller or a computer's memory at the plant.

MEASUREMENT AND PAYMENT

Full compensation for LAS is included in the contract price paid per tonne for HMA as designated in the Engineer's Estimate and no separate payment will be made therefor.

10-1.83

PILING:

GENERAL

Piling shall conform to the provisions in Section 49, "Piling," of the Standard Specifications, and these special provisions.

CAST-IN-DRILLED-HOLE CONCRETE PILES

Cast-in-drilled-hole concrete piling shall conform to the provisions in Section 49-4, "Cast-In-Place Concrete Piles," of the Standard Specifications and these special provisions.

Cast-in-drilled-hole concrete piles 600 mm in diameter or larger may be constructed by excavation and depositing concrete under slurry.

Materials

Concrete deposited under slurry shall have a nominal penetration equal to or greater than 90 mm. Concrete shall be proportioned to prevent excessive bleed water and segregation. Concrete deposited under slurry shall contain not less than 400 kg of cementitious material per cubic meter.

The combined aggregate grading used in concrete for cast-in-drilled-hole concrete piling shall be either the 25-mm maximum grading, the 12.5-mm maximum grading, or the 9.5-mm maximum grading and shall conform to the requirements in Section 90-3 "Aggregate Gradings," of the Standard Specifications.

Mineral Slurry

Mineral slurry shall be mixed and thoroughly hydrated in slurry tanks, and slurry shall be sampled from the slurry tanks and tested before placement in the drilled hole.

Slurry shall be recirculated or continuously agitated in the drilled hole to maintain the specified properties.

Recirculation shall include removal of drill cuttings from the slurry before discharging the slurry back into the drilled hole. When recirculation is used, the slurry shall be sampled and tested at least every 2 hours after beginning its use until tests show that the samples taken from the slurry tank and from near the bottom of the hole have consistent specified properties. Subsequently, slurry shall be sampled at least twice per shift as long as the specified properties remain consistent.

Slurry that is not recirculated in the drilled hole shall be sampled and tested at least every 2 hours after beginning its use. The slurry shall be sampled mid-height and near the bottom of the hole. Slurry shall be recirculated when tests show that the samples taken from mid-height and near the bottom of the hole do not have consistent specified properties.

Slurry shall also be sampled and tested prior to final cleaning of the bottom of the hole and again just prior to placing concrete. Samples shall be taken from mid-height and near the

bottom of the hole. Cleaning of the bottom of the hole and placement of the concrete shall not start until tests show that the samples taken from mid-height and near the bottom of the hole have consistent specified properties.

Mineral slurry shall be tested for conformance to the requirements shown in the following table:

MINERAL SLURRY		
PROPERTY	REQUIREMENT	TEST
Density (kg/m ³) - before placement in the drilled hole - during drilling - prior to final cleaning - immediately prior to placing concrete	1030* to 1110* 1030* to 1200*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) bentonite attapulgate	 29 to 53 29 to 42	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8 to 10.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - immediately prior to placing concrete	 less than or equal to 4.0	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ . Slurry temperature shall be at least 4°C when tested.		

Any caked slurry on the sides or bottom of hole shall be removed before placing reinforcement. If concrete is not placed immediately after placing reinforcement, the reinforcement shall be removed and cleaned of slurry, the sides of the drilled hole cleaned of caked slurry, and the reinforcement again placed in the hole for concrete placement.

Synthetic Slurry

Synthetic slurries shall be used in conformance with the manufacturer's recommendations and these special provisions. The following synthetic slurries may be used:

PRODUCT	MANUFACTURER
SlurryPro CDP	KB Technologies Ltd. 3648 FM 1960 West Suite 107 Houston, TX 77068 (800) 525-5237
Super Mud	PDS Company c/o Champion Equipment Company 8140 East Rosecrans Ave. Paramount, CA 90723 (562) 634-8180
Shore Pac GCV	CETCO Drilling Products Group 1350 West Shure Drive Arlington Heights, IL 60004 (847) 392-5800
Novagel Polymer	Geo-Tech Drilling Fluids 220 N. Zapata Hwy, Suite 11A Laredo, TX 78043 (210) 587-4758

Inclusion of a synthetic slurry on the above list may be obtained by meeting the Department's requirements for synthetic slurries. The requirements can be obtained from the Office of Structure Design, P.O. Box 942874, Sacramento, CA 94274-0001. Synthetic slurries listed may not be appropriate for a given site.

Synthetic slurries shall not be used in holes drilled in primarily soft or very soft cohesive soils as determined by the Engineer.

A manufacturer's representative, as approved by the Engineer, shall provide technical assistance for the use of their product, shall be at the site prior to introduction of the synthetic slurry into a drilled hole, and shall remain at the site until released by the Engineer.

Synthetic slurries shall be sampled and tested at both mid-height and near the bottom of the drilled hole. Samples shall be taken and tested during drilling as necessary to verify the control of the properties of the slurry. Samples shall be taken and tested when drilling is complete, but prior to final cleaning of the bottom of the hole. When samples are in conformance with the requirements shown in the following tables for each slurry product, the bottom of the hole shall be cleaned and any loose or settled material removed. Samples shall be obtained and tested after final cleaning and immediately prior to placing concrete.

SlurryPro CDP synthetic slurries shall be tested for conformance to the requirements shown in the following table:

SLURRYPRO CDP KB Technologies Ltd.		
PROPERTY	REQUIREMENT	TEST
Density (kg/m ³) - during drilling - prior to final cleaning - just prior to placing concrete.	less than or equal to 1075* less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete	53 to 127 less than or equal to 74	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	6 to 11.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ . Slurry temperature shall be at least 4°C when tested.		

Super Mud synthetic slurries shall be tested for conformance to the requirements shown in the following table:

SUPER MUD PDS Company		
PROPERTY	REQUIREMENT	TEST
Density (kg/m ³) - prior to final cleaning - just prior to placing concrete	less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete	34 to 64 less than or equal to 64	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8 to 10.0	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ . Slurry temperature shall be at least 4°C when tested.		

Shore Pac GCV synthetic slurries shall be tested for conformance to the requirements shown in the following table:

Shore Pac GCV CETCO Drilling Products Group		
PROPERTY	REQUIREMENT	TEST
Density (kg/m ³) - prior to final cleaning - just prior to placing concrete	less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete	35 to 78 less than or equal to 60	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	8.0 to 11.0	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ . Slurry temperature shall be at least 4°C when tested.		

Novagel Polymer synthetic slurries shall be tested for conformance to the requirements shown in the following table:

NOVAGEL POLYMER Geo-Tech Drilling Fluids		
PROPERTY	REQUIREMENT	TEST
Density (kg/m ³) - during drilling - prior to final cleaning - just prior to placing concrete	less than or equal to 1075* less than or equal to 1025*	Mud Weight (Density) API 13B-1 Section 1
Viscosity (seconds/liter) - during drilling - prior to final cleaning - just prior to placing concrete	48 to 110 less than or equal to 110	Marsh Funnel and Cup API 13B-1 Section 2.2
pH	6.0 to 11.5	Glass Electrode pH Meter or pH Paper
Sand Content (percent) - prior to final cleaning - just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, slurry may be used in salt water, and the allowable densities may be increased up to 32 kg/m ³ . Slurry temperature shall be at least 4°C when tested.		

Water Slurry

At the option of the Contractor, water may be used as slurry when casing is used for the entire length of the drilled hole.

Water slurry shall be tested for conformance to the requirements shown in the following table:

WATER SLURRY		
PROPERTY	REQUIREMENT	TEST
Density (kg/m ³) - prior to final cleaning - just prior to placing concrete	1017 *	Mud Weight (Density) API 13B-1 Section 1
Sand Content (percent) - prior to final cleaning - just prior to placing concrete	less than or equal to 0.5	Sand API 13B-1 Section 5
*When approved by the Engineer, salt water slurry may be used, and the allowable densities may be increased up to 32 kg/m ³ .		

Construction

The Contractor shall submit a placing plan to the Engineer for approval prior to producing the test batch for cast-in-drilled-hole concrete piling and at least 10 working days prior to constructing piling. The plan shall include complete descriptions, details, and supporting calculations as listed below:

A. Requirements for all cast-in-drilled hole concrete piling:

1. Concrete mix design, certified test data, and trial batch reports.
2. Drilling or coring methods and equipment.
3. Proposed method for casing installation and removal when necessary.
4. Plan view drawing of pile showing reinforcement and inspection pipes, if required.
5. Methods for placing, positioning, and supporting bar reinforcement.
6. Methods and equipment for accurately determining the depth of concrete and actual and theoretical volume placed, including effects on volume of concrete when any casings are withdrawn.
7. Methods and equipment for verifying that the bottom of the drilled hole is clean prior to placing concrete.
8. Methods and equipment for preventing upward movement of reinforcement, including the Contractor's means of detecting and measuring upward movement during concrete placement operations.

B. Additional requirements when concrete is placed under slurry:

1. Concrete batching, delivery, and placing systems, including time schedules and capacities therefor. Time schedules shall include the time required for each concrete placing operation at each pile.
2. Concrete placing rate calculations. When requested by the Engineer, calculations shall be based on the initial pump pressures or static head on the concrete and losses throughout the placing system, including anticipated head of slurry and concrete to be displaced.
3. Suppliers' test reports on the physical and chemical properties of the slurry and any proposed slurry chemical additives, including Material Safety Data Sheet.
4. Slurry testing equipment and procedures.
5. Methods of removal and disposal of excavation, slurry, and contaminated concrete, including removal rates.
6. Methods and equipment for slurry agitating, recirculating, and cleaning.

In addition to compressive strength requirements, the consistency of the concrete to be deposited under slurry shall be verified before use by producing a test batch. The test batch shall be produced and delivered to the project under conditions and in time periods similar to those expected during the placement of concrete in the piles. Concrete for the test batch shall be placed in an excavated hole or suitable container of adequate size to allow for testing as specified herein. Depositing of test batch concrete under slurry will not be required. In addition to meeting the specified nominal penetration, the test batch shall meet the following requirements:

- A. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be 2 hours or less, the test batch shall demonstrate that the proposed concrete mix design achieves either a penetration of at least 50 mm or a slump of at least 125 mm after twice that time has elapsed.
- B. For piles where the time required for each concrete placing operation, as submitted in the placing plan, will be more than 2 hours, the test batch shall demonstrate that the proposed concrete mix design achieves either a penetration of at least 50 mm or a slump of at least 125 mm after that time plus 2 hours has elapsed.

The time period shall begin at the start of placement. The concrete shall not be vibrated or agitated during the test period. Penetration tests shall be performed in conformance with the requirements in California Test 533. Slump tests shall be performed in conformance with the requirements in ASTM Designation: C 143. Upon completion of testing, the concrete shall be disposed of in conformance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications. The concrete deposited under slurry shall be carefully placed in a compact, monolithic mass and by a method that will prevent washing of the concrete. Concrete deposited under slurry need not be vibrated. Placing concrete shall be a continuous operation lasting not more than the time required for each concrete placing operation at each pile, as submitted in the placing plan, unless otherwise approved in writing by the Engineer. The concrete shall be placed with concrete pumps and delivery tube system of adequate number and size to complete the placing of concrete in the time specified. The delivery tube system shall consist of one of the following:

- A. A tremie tube or tubes, each of which are at least 250 mm in diameter, fed by one or more concrete pumps.

B. One or more concrete pump tubes, each fed by a single concrete pump.

The delivery tube system shall consist of watertight tubes with sufficient rigidity to keep the ends always in the mass of concrete placed. If only one delivery tube is utilized to place the concrete, the tube shall be placed near the center of the drilled hole. Multiple tubes shall be uniformly spaced in the hole. Internal bracing for the steel reinforcing cage shall accommodate the delivery tube system. Tremies shall not be used for piles without space for a 250-mm tube.

Spillage of concrete into the slurry during concrete placing operations shall not be allowed. Delivery tubes shall be capped with a watertight cap, or plugged above the slurry level with a good quality, tight fitting, moving plug that will expel the slurry from the tube as the tube is charged with concrete. The cap or plug shall be designed to be released as the tube is charged. The pump discharge or tremie tube shall extend to the bottom of the hole before charging the tube with concrete. After charging the delivery tube system with concrete, the flow of concrete through a tube shall be induced by slightly raising the discharge end.

During concrete placement, the tip of the delivery tube shall be maintained as follows to prevent reentry of the slurry into the tube. Until at least 3 m of concrete has been placed, the tip of the delivery tube shall be within 150 mm of the bottom of the drilled hole, and then the embedment of the tip shall be maintained at least 3 m below the top surface of the concrete. Rapid raising or lowering of the delivery tube shall not be permitted. If the seal is lost or the delivery tube becomes plugged and must be removed, the tube shall be withdrawn, the tube cleaned, the tip of the tube capped to prevent entrance of the slurry, and the operation restarted by pushing the capped tube 3 m into the concrete and then reinitiating the flow of concrete.

When slurry is used, a fully operational standby concrete pump, adequate to complete the work in the time specified, shall be provided at the site during concrete placement. The slurry level shall be maintained within 300 mm of the top of the drilled hole.

A log of concrete placement for each drilled hole shall be maintained by the Contractor when concrete is deposited under slurry. The log shall show the pile location, tip elevation, dates of excavation and concrete placement, total quantity of concrete deposited, length and tip elevation of any casing, and details of any hole stabilization method and materials used. The log shall include a 215 mm x 280 mm sized graph of the concrete placed versus depth of hole filled. The graph shall be plotted continuously throughout placing of concrete. The depth of drilled hole filled shall be plotted vertically with the pile tip oriented at the bottom and the quantity of concrete shall be plotted horizontally. Readings shall be made at least at each 1.5 m of pile depth, and the time of the reading shall be indicated. The graph shall be labeled with the pile location, tip elevation, cutoff elevation, and the dates of excavation and concrete placement. The log shall be delivered to the Engineer within one working day of completion of placing concrete in the pile.

After placing reinforcement and prior to placing concrete in the drilled hole, if drill cuttings settle out of the slurry, the bottom of the drilled hole shall be cleaned. The Contractor shall verify that the bottom of the drilled hole is clean.

If temporary casing is used, concrete placed under slurry shall be maintained at a level at least 1.5 m above the bottom of the casing. The withdrawal of casings shall not cause contamination of the concrete with slurry.

Acceptance Testing and Mitigation

Vertical inspection pipes for acceptance testing shall be provided in all cast-in-drilled-hole concrete piles that are 600 mm in diameter or larger, except when the holes are dry or when the holes are dewatered without the use of temporary casing to control ground water.

Inspection pipes shall be Schedule 40 polyvinyl chloride pipes with a nominal inside diameter of 50 mm. Each inspection pipe shall be capped top and bottom and shall have watertight couplers to provide a clean, dry and unobstructed 50-mm diameter clear opening from 1.0 m above the pile cutoff down to the bottom of the reinforcing cage.

Inspection pipes shall be placed around the pile, inside the outermost spiral or hoop reinforcement, and 75 mm clear of the vertical reinforcement, at a uniform spacing not exceeding 840 mm measured along the circle passing through the centers of inspection pipes. A minimum of 2 inspection pipes per pile shall be used. When the vertical reinforcement is not bundled and each bar is not more than 26 mm in diameter, inspection pipes may be placed 50 mm clear of the vertical reinforcement. The inspection pipes shall be placed to provide the maximum diameter circle that passes through the centers of the inspection pipes while maintaining the clear spacing required herein. The pipes shall be installed in straight alignment, parallel to the main reinforcement, and securely fastened in place to prevent misalignment during installation of the reinforcement and placing of concrete in the hole.

The Contractor shall log the location of the inspection pipe couplers with respect to the plane of pile cut off, and these logs shall be delivered to the Engineer upon completion of the placement of concrete in the drilled hole.

After placing concrete and before requesting acceptance tests, each inspection pipe shall be tested by the Contractor in the presence of the Engineer by passing a 48.3-mm diameter rigid cylinder 610 mm long through the complete length of pipe. If the 48.3-mm diameter rigid cylinder fails to pass any of the inspection pipes, the Contractor shall attempt to pass a 32.0-mm diameter rigid cylinder 1.375 m long through the complete length of those pipes in the presence of the Engineer. If an inspection pipe fails to pass the 32.0-mm diameter cylinder, the Contractor shall immediately fill all inspection pipes in the pile with water.

The Contractor shall replace each inspection pipe that does not pass the 32.0-mm diameter cylinder with a 50.8-mm diameter hole cored through the concrete for the entire length of the pile. Cored holes shall be located as close as possible to the inspection pipes they are replacing and shall be no more than 150 mm inside the reinforcement. Coring shall not damage the pile reinforcement. Cored holes shall be made with a double wall core barrel system utilizing a split tube type inner barrel. Coring with a solid type inner barrel will not be allowed. Coring methods and equipment shall provide intact cores for the entire length of the pile concrete. The coring operation shall be logged by an Engineering Geologist or Civil Engineer licensed in the State of California and experienced in core logging. Coring logs shall include complete descriptions of inclusions and voids encountered during coring, and shall be delivered to the Engineer upon completion. Concrete cores shall be preserved,

identified with the exact location the core was recovered from within the pile, and made available for inspection by the Engineer.

Acceptance tests of the concrete will be made by the Engineer, without cost to the Contractor. Acceptance tests will evaluate the homogeneity of the placed concrete. Tests will include gamma-gamma logging. Tests may also include crosshole sonic logging and other means of inspection selected by the Engineer. The Contractor shall not conduct operations within 8.0 m of the gamma-gamma logging operations. The Contractor shall separate reinforcing steel as necessary to allow the Engineer access to the inspection pipes to perform gamma-gamma logging or other acceptance testing. After requesting acceptance tests and providing access to the piling, the Contractor shall allow 3 weeks for the Engineer to conduct these tests and make determination of acceptance if the 48.3-mm diameter cylinder passed all inspection pipes, and 4 weeks if only the 32.0-mm diameter cylinder passed all inspection pipes. Should the Engineer fail to complete these tests within the time allowance, and if in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in inspection, the delay will be considered a right of way delay as specified in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

All inspection pipes and cored holes in a pile shall be dewatered and filled with grout after notification by the Engineer that the pile is acceptable. Placement and removal of water in the inspection pipes shall be at the Contractor's expense. Grout shall conform to the provisions in Section 50-1.09, "Bonding and Grouting," of the Standard Specifications. The inspection pipes and holes shall be filled using grout tubes that extend to the bottom of the pipe or hole or into the grout already placed.

If acceptance testing performed by the Engineer determines that a pile does not meet the requirements of the specifications, then that pile will be rejected and all depositing of concrete under slurry or concrete placed using temporary casing for the purpose of controlling groundwater shall be suspended until written changes to the methods of pile construction are approved in writing by the Engineer.

The Contractor shall submit to the Engineer for approval a mitigation plan for repair, supplementation, or replacement for each rejected cast-in-drilled-hole concrete pile, and this plan shall conform to the provisions in Section 5-1.02, "Plans and Working Drawings," of the Standard Specifications. Prior to submitting this mitigation plan, the Engineer will hold a repair feasibility meeting with the Contractor to discuss the feasibility of repairing rejected piling. The Engineer will consider the size of the defect, the location of the defect, and the design information and corrosion protection considerations for the pile. This information will be made available to the Contractor, if appropriate, for the development of the mitigation plan. If the Engineer determines that it is not feasible to repair the rejected pile, the Contractor shall not include repair as a means of mitigation and shall proceed with the submittal of a mitigation plan for replacement or supplementation of the rejected pile. If the Engineer determines that a rejected pile does not require mitigation due to structural, geotechnical, or corrosion concerns, the Contractor may elect to 1) repair the pile per the approved mitigation plan, or 2) not repair anomalies found during acceptance testing of that pile. For such unrepaired piles, the Contractor shall pay to the State, \$400 per cubic meter for the portion of the pile affected by the anomalies. The volume, in cubic meters, of the portion of the pile affected by the anomalies, shall be calculated as the area of the cross-

section of the pile affected by each anomaly, in square meters, as determined by the Engineer, multiplied by the distance, in meters, from the top of each anomaly to the specified tip of the pile. If the volume calculated for one anomaly overlaps the volume calculated for additional anomalies within the pile, the calculated volume for the overlap shall only be counted once. In no case shall the amount of the payment to the State for any such pile be less than \$400. The Department may deduct the amount from any moneys due, or that may become due the Contractor under the contract.

Pile mitigation plans shall include the following:

- A. The designation and location of the pile addressed by the mitigation plan.
- B. A review of the structural, geotechnical, and corrosion design requirements of the rejected pile.
- C. A step by step description of the mitigation work to be performed, including drawings if necessary.
- D. An assessment of how the proposed mitigation work will address the structural, geotechnical, and corrosion design requirements of the rejected pile.
- E. Methods for preservation or restoration of existing earthen materials.
- F. A list of affected facilities, if any, with methods and equipment for protection of these facilities during mitigation.
- G. The State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor's (and Subcontractor's if applicable) name on each sheet.
- H. A list of materials, with quantity estimates, and personnel, with qualifications, to be used to perform the mitigation work.
- I. The seal and signature of an engineer who is licensed as a Civil Engineer by the State of California.

For rejected piles to be repaired, the Contractor shall submit a pile mitigation plan that contains the following additional information:

- A. An assessment of the nature and size of the anomalies in the rejected pile.
- B. Provisions for access for additional pile testing if required by the Engineer.

For rejected piles to be replaced or supplemented, the Contractor shall submit a pile mitigation plan that contains the following additional information:

- A. The proposed location and size of additional piling.
- B. Structural details and calculations for any modification to the structure to accommodate the replacement or supplemental piling.

All provisions for cast-in-drilled-hole concrete piling shall apply to replacement piling. The Contractor shall allow the Engineer 3 weeks to review the mitigation plan after a complete submittal has been received.

Should the Engineer fail to review the complete pile mitigation submittal within the time specified, and if, in the opinion of the Engineer, the Contractor's controlling operation is delayed or interfered with by reason of the delay in reviewing the pile mitigation plan, an extension of time commensurate with the delay in completion of the work thus caused will

be granted in conformance with the provisions in Section 8-1.09, "Right of Way Delays," of the Standard Specifications.

When repairs are performed, the Contractor shall submit a mitigation report to the Engineer within 10 days of completion of the repair. This report shall state exactly what repair work was performed and quantify the success of the repairs relative to the submitted mitigation plan. The mitigation report shall be stamped and signed by an engineer that is licensed as a Civil Engineer by the State of California. The mitigation report shall show the State assigned contract number, bridge number, full name of the structure as shown on the contract plans, District-County-Route-Kilometer Post, and the Contractor (and Subcontractor if applicable) name on each sheet. The Engineer will be the sole judge as to whether a mitigation proposal is acceptable, the mitigation efforts are successful, and to whether additional repairs, removal and replacement, or construction of a supplemental foundation is required.

PAYMENT

Full compensation for Cast-In-Drilled-Hole Pile shall be considered as included in the contract lump sum prices paid for Traffic Signal (Location 1) – Garbani Road, Traffic Signal (Location 2), Holland Road, and Modify Traffic Signal (Location 1), Scott Road and no additional compensation will be allowed therefore

10-1.84

CONCRETE STRUCTURES:

Portland cement concrete structures shall conform to the provisions in Section 51, "Concrete Structures," of the Standard Specifications and these special provisions.

GENERAL

Concrete for reinforced concrete box culverts, headwalls and Metropolitan Water District (MWD) protective slabs shall be constructed of minor concrete.

Attention is directed to "Nonhighway Facilities (Including Utilities)" and "Order of Work" of these special provisions regarding pipeline loading restrictions imposed by MWD and the Contractor's submittal of procedures and construction equipment specifications that will be used to perform the work within the proximity of MWD pipeline facilities.

Rigid cellular polystyrene thermal insulation foam conforming to the requirements in ASTM Designation: C 578 shall be furnished and installed at MWD protective slabs in conformance with the details shown on the plans.

10-1.85

DRILL AND BOND DOWEL (CHEMICAL ADHESIVE):

Drilling and bonding dowels with chemical adhesives shall conform to the details shown on the plans and these special provisions.

Reinforcing steel dowels shall conform to the provisions in "Reinforcement" of these special provisions.

Threaded rods used as dowels shall conform to the provisions in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications. The threaded rods shall be installed in conformance with the requirements for dowels specified herein.

Chemical adhesives to be used shall be selected from the Pre-Qualified Products List at:

http://www.dot.ca.gov/hq/esc/approved_products_list/

The Contractor may propose to use a chemical adhesive not on the Pre-Qualified Products List. Information regarding product qualification can be obtained at the Transportation Laboratory.

The chemical adhesive system used shall be appropriate for the concrete temperature and installation conditions in conformance with the requirements in the Department's prequalified list.

Chemical adhesive systems shall be accompanied by a Certificate of Compliance as provided in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The certificate shall state that the material complies in all respects to the requirements of ICBO AC58 and Caltrans Augmentation/Revisions to ICBO AC58 available at the Transportation Laboratory and at:

http://www.dot.ca.gov/hq/esc/approved_products_list/

At least 25 days prior to use, the Contractor shall submit one sample of each chemical adhesive system per lot to the Transportation Laboratory for testing. The sample shall consist of one unit of chemical adhesive, one mixing nozzle, and one retaining nut. A lot of chemical adhesives is defined as 100 units, or fraction thereof, of the same brand and product name.

Each chemical adhesive system shall be clearly and permanently marked with the manufacturer's name, model number of the system, manufacturing date, lot number, shelf life or expiration date, and current ICBO Evaluation Report (ER) number. Each carton of chemical adhesives shall contain the manufacturer's recommended installation procedures and warnings or precautions concerning the contents as may be required by State or Federal laws and regulations.

The holes shall be drilled by methods that will not shatter or damage the concrete adjacent to the holes. If reinforcement is encountered during drilling, before the specified depth is attained, the Engineer shall be notified. Unless the Engineer approves coring through the reinforcement, the hole will be rejected and a new hole, in which reinforcement is not encountered, shall be drilled adjacent to the rejected hole. The drilled holes shall be cleaned in conformance with the manufacturer's instructions and shall be dry at the time of placing the chemical adhesive. Unless otherwise specified, the diameter and depth of drilled holes shall conform to the values listed in the ICBO ER for the size of dowel or rod being installed.

The depth of the drilled hole listed in the ICBO ER shall be increased by 50 percent when epoxy coating of dowels is required.

Storage and installation procedures shall be as recommended by the manufacturer. A copy of the manufacturer's recommended installation procedure shall be provided to the Engineer at least 2 days prior to the start of work.

Immediately after inserting the dowels into the chemical adhesive, the dowels shall be supported as necessary to prevent movement during curing and shall remain undisturbed until the epoxy has cured a minimum time as specified in the Department's Pre-Qualified Products List. Dowels that are improperly bonded, as determined by the Engineer, will be rejected. Adjacent new holes shall be drilled, and new dowels shall be placed and securely bonded to the concrete. All work necessary to correct improperly bonded dowels shall be performed at the Contractor's expense.

Unless otherwise provided, dowels to be bonded into drilled holes will be measured and paid for as bar reinforcing steel (box culvert).

Full compensation for drilling holes, including coring through reinforcement when approved by the Engineer, and bonding dowels with chemical adhesives shall be considered as included in the contract price paid per cubic meter for structural concrete (box culvert) and no separate payment will be made therefor.

MEASUREMENT AND PAYMENT

Measurement and payment for concrete in structures shall conform to the provisions in Section 51-1.22, "Measurement," and Section 51-1.23, "Payment," of the Standard Specifications and these special provisions.

Concrete for Metropolitan Water District protective slab will be measured and paid for by the cubic meter as minor concrete (minor structure).

Full compensation for furnishing and installing rigid cellular polystyrene thermal insulation in MWD slabs shall be considered as included in the contract price paid per cubic meter for minor concrete (minor structure) and no additional compensation will be allowed therefor. Concrete for box culvert and headwalls will be measured and paid for by the cubic meter as minor concrete (headwall and RCB).

10-1.86 REINFORCEMENT:

Reinforcement shall conform to the provisions in Section 52, "Reinforcement," of the Standard Specifications and these special provisions.

The Department's mechanical splices prequalified list can be found at the following internet site:

http://www.dot.ca.gov/hq/esc/approved_products_list/

The provisions of "Welding Quality Control" of these special provisions shall not apply to resistance butt welding.

MEASUREMENT AND PAYMENT

Full compensation for reinforcing steel used in box culverts and headwalls shall be considered as included in the various contract items of work involving reinforcing steel and no separate payment will be made therefor.

10-1.87 SHOTCRETE:

Shotcrete for brow ditches and drop structures shall conform to the provisions in Section 53, "Shotcrete," of the Standard Specifications and these special provisions.

MEASUREMENT AND PAYMENT

Shotcrete for brow ditch and drop structure will be measured and paid for by the cubic meter as Shotcrete (Brow Ditch and Drop Structure) in accordance with the provisions in Section 53-1.07, "Measurement" and 53-1.08, "Payment" of the Standard Specifications.

10-1.88 ROADSIDE SIGNS:

Roadside signs shall be furnished and installed at the locations shown on the plans or where designated by the Engineer and in conformance with the provisions in Section 56-2, "Roadside Signs," of the Standard Specifications and these special provisions.

The Contractor shall furnish roadside sign panels in conformance with the provisions in "Furnish Sign" of these special provisions.

Wood posts shall be pressure treated after fabrication in conformance with the provisions in Section 58, "Preservative Treatment of Lumber, Timber and Piling," of the Standard Specifications and AWPAs Use Category System: UC4A, Commodity Specification A or B.

10-1.89 FURNISH SIGN:

Signs shall be fabricated and furnished in accordance with details shown on the plans, the Traffic Sign Specifications, and these special provisions.

Traffic Sign Specifications for California sign codes are available for review at:

<http://www.dot.ca.gov/hq/traffops/signtech/signdel/specs.htm>

Traffic Sign Specifications for signs referenced with Federal MUTCD sign codes can be found in Standard Highway Signs Book, administered by the Federal Highway Administration, which is available for review at:

http://mutcd.fhwa.dot.gov/ser-shs_millennium.htm

Information on cross-referencing California sign codes with the Federal MUTCD sign codes is available at:

<http://www.dot.ca.gov/hq/traffops/signtech/signdel/specs.htm>

Temporary or permanent signs shall be free from blemishes that may affect the serviceability and detract from the general sign color and appearance when viewing during daytime and nighttime from a distance of 8 m. The face of each finished sign shall be uniform, flat, smooth, and free of defects, scratches, wrinkles, gel, hard spots, streaks, extrusion marks, and air bubbles. The front, back, and edges of the sign panels shall be free of router chatter marks, burns, sharp edges, loose rivets, delaminated skins, excessive adhesive over spray and aluminum marks.

QUALITY CONTROL FOR SIGNS

The requirements of "Quality Control for Signs" in this section shall not apply to construction area signs.

No later than 14 days before sign fabrication, the Contractor shall submit a written copy of the quality control plan for signs to the Engineer for review. The Engineer will have 10 days to review the quality control plan. Sign fabrication shall not begin until the Engineer approves the Contractor's quality control plan in writing. The Contractor shall submit to the Engineer at least 3 copies of the approved quality control plan. The quality control plan shall include, but not be limited to the following requirements:

- A. Identification of the party responsible for quality control of signs,
- B. Basis of acceptance for incoming raw materials at the fabrication facility,
- C. Type, method and frequency of quality control testing at the fabrication facility,
- D. List (by manufacturer and product name) of process colors, protective overlay film, retroreflective sheeting and black non-reflective film,
- E. Recommended cleaning procedure for each product, and
- F. Method of packaging, transport and storage for signs.

No legend shall be installed at the project site. Legend shall include letters, numerals, tildes, bars, arrows, route shields, symbols, logos, borders, artwork, and miscellaneous characters. The style, font, size, and spacing of the legend shall conform to the Standard Alphabets published in the FHWA Standard Highway Signs Book. The legend shall be oriented in the same direction in accordance with the manufacturer's orientation marks found on the retroreflective sheeting.

On multiple panel signs, legend shall be placed across joints without affecting the size, shape, spacing, and appearance of the legend. Background and legend shall be wrapped around interior edges of formed panel signs as shown on plans to prevent delamination.

The following notation shall be placed on the lower right side of the back of each sign where the notation will not be blocked by the sign post or frame:

- A. PROPERTY OF STATE OF CALIFORNIA,
- B. Name of the sign manufacturer,

- C. Month and year of fabrication,
- D. Type of retroreflective sheeting, and
- E. Manufacturer's identification and lot number of retroreflective sheeting.

The above notation shall be applied directly to the aluminum sign panels in 6-mm upper case letters and numerals by die-stamp and applied by similar method to the fiberglass reinforced plastic signs. Painting, screening, or engraving the notation will not be allowed. The notation shall be applied without damaging the finish of the sign.

Signs with a protective overlay film shall be marked with a dot of 10 mm diameter. The dot placed on white border shall be black, while the dot placed on black border shall be white. The dot shall be placed on the lower border of the sign before application of the protective overlay film and shall not be placed over the legend and bolt holes. The application method and exact location of the dot shall be determined by the manufacturer of the signs.

For sign panels that have a minor dimension of 1220 mm or less, no splice will be allowed in the retroreflective sheet except for the splice produced during the manufacturing of the retroreflective sheeting. For sign panels that have a minor dimension greater than 1220 mm, only one horizontal splice will be allowed in the retroreflective sheeting.

Unless specified by the manufacturer of the retroreflective sheeting, splices in retroreflective sheeting shall overlap by a minimum of 25 mm. Splices shall not be placed within 50 mm from edges of the panels. Except at the horizontal borders, the splices shall overlap in the direction from top to bottom of the sign to prevent moisture penetration. The retroreflective sheeting at the overlap shall not exhibit a color difference under the incident and reflected light.

Signs exhibiting a significant color difference between daytime and nighttime shall be replaced immediately.

Repairing sign panels will not be allowed except when approved by the Engineer.

The Department will inspect signs at the Contractor's facility and delivery location, and in accordance with Section 6, "Control of Materials," of the Standard Specifications. The Engineer will inspect signs for damage and defects before and after installation.

Regardless of kind, size, type, or whether delivered by the Contractor or by a common carrier, signs shall be protected by thorough wrapping, tarping, or other methods to ensure that signs are not damaged by weather conditions and during transit. Signs shall be dry during transit and shipped on palettes, in crates, or tier racks. Padding and protective materials shall be placed between signs as appropriate. Finished sign panels shall be transported and stored by method that protects the face of signs from damage. The Contractor shall replace wet, damaged, and defective signs.

Signs shall be stored in dry environment at all times. Signs shall not rest directly on the ground or become wet during storage. Signs, whether stored indoor or outdoor, shall be

free standing. In areas of high heat and humidity signs shall be stored in enclosed climate-controlled trailers or containers. Signs shall be stored indoor if duration of the storage will exceed 30 days.

Screen processed signs shall be protected, transported and stored as recommended by the manufacturer of the retroreflective sheeting.

When requested, the Contractor shall provide the Engineer test samples of signs and materials used at various stages of production. Sign samples shall be 300 mm x 300 mm in size with applied background, letter or numeral, and border strip.

The Contractor shall assume the costs and responsibilities resulting from the use of patented materials, equipment, devices, and processes for the Contractor's work.

SHEET ALUMINUM

Alloy and temper designations for sheet aluminum shall be in accordance with ASTM Designation: B209.

The Contractor shall furnish the Engineer a Certificate of Compliance in accordance to Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the sheet aluminum.

Sheet aluminum shall be pretreated in accordance to ASTM Designation: B449. Surface of the sheet aluminum shall be cleaned, deoxidized, and coated with a light and tightly adherent chromate conversion coating free of powdery residue. The conversion coating shall be Class 2 with a mass between 108 mg/m^2 and 377 mg/m^2 , and an average mass of 269 mg/m^2 . Following the cleaning and coating process, the sheet aluminum shall be protected from exposure to grease, oils, dust, and contaminants.

Sheet aluminum shall be free of buckles, warps, dents, cockles, burrs, and defects resulting from fabrication.

Base plate for standard route marker shall be die cut.

RETROREFLECTIVE SHEETING

The contractor shall furnish retroreflective sheeting for sign background and legend in accordance with ASTM Designation: D4956 and "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

Retroreflective sheeting shall be applied to sign panels as recommended by the retroreflective sheeting manufacturer without stretching, tearing, and damage.

Class 1, 3, or 4 adhesive backing shall be used for Type II, III, IV, VII, VIII, and IX retroreflective sheeting. Class 2 adhesive backing may also be used for Type II retroreflective sheeting. The adhesive backing shall be pressure sensitive and fungus resistant.

When the color of the retroreflective sheeting determined from instrumental testing is in dispute, the Engineer's visual test will govern.

PROCESS COLOR AND FILM

The Contractor shall furnish and apply screened process color, non-reflective opaque black film, and protective overlay film of the type, kind, and product that are approved by the manufacturer of the retroreflective sheeting.

The Contractor shall furnish the Engineer a Certificate of Compliance in accordance to Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for the screened process color, non-reflective opaque black film, and protective overlay film.

The surface of the screened process color shall be flat and smooth. When the screened process colors determined from the instrumental testing in accordance to ASTM Designation: D4956 are in dispute, the Engineer's visual test will govern.

The Contractor shall provide patterns, layouts, and set-ups necessary for the screened process.

The Contractor may use green, red, blue, and brown reverse-screened process colors for background and non-reflective opaque black film or black screened process color for legend. The coefficient of retroreflection for reverse-screened process colors on white retroreflective sheeting shall not be less than 70 percent of the coefficient of retroreflection specified in ASTM Designation: D4956.

The screened process colors and non-reflective opaque black film shall have the same outdoor weatherability as that of the retroreflective sheeting.

After curing, screened process colors shall withstand removal when tested by applying 3M Company Scotch Brand Cellophane Tape No. 600 or equivalent tape over the color and removing with one quick motion at 90° angle.

SINGLE SHEET ALUMINUM SIGN

Single Sheet aluminum signs shall be fabricated and furnished with or without frame. The Contractor shall furnish the sheet aluminum in accordance to "Sheet Aluminum" of these special provisions. Single sheet aluminum signs shall be fabricated from sheet aluminum alloy 6061-T6 or 5052-H38.

Single Sheet aluminum signs shall not have a vertical splice in the sheet aluminum. For signs with depth greater than 1220 mm, one horizontal splice will be allowed in the sheet aluminum.

Framing for single sheet aluminum sign shall consist of aluminum channel or rectangular aluminum tubing. The framing shall have a length tolerance of ± 3 mm. The face sheet shall be affixed to the frame with rivets of 5-mm diameter. Rivets shall be placed within the web of channels and shall not be placed less than 13 mm from edges of the sign panels. Rivets shall be made of aluminum alloy 5052 and shall be anodized or treated with conversion coating to prevent corrosion. The exposed portion of rivets on the face of signs shall be the same color as the background or legend where the rivets are placed.

Finished signs shall be flat within a tolerance of ± 3 mm per meter when measured across the plane of the sign in all directions. The finished signs shall have an overall tolerance within ± 3 mm of the detailed dimensions.

Aluminum channels or rectangular aluminum tubings shall be welded together with the inert gas shielded-arc welding process using E4043 aluminum electrode filler wires as shown on the plans. Width of the filler shall be equal to wall thickness of smallest welded channel or tubing.

MEASUREMENT AND PAYMENT

Furnishing signs (except for construction area signs) will be measured by the square meter and the quantity to be paid for will be the total area, in square meters, of the sign panel types installed in place.

The contract price paid per square meter for furnish sign of the types specified in the Engineer's estimate shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in fabricating and furnishing the signs, including removable sign panel frame and fastening hardware, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.90

ALTERNATIVE PIPE:

Alternative pipe culverts must comply with Section 62, "Alternative Culverts," of the Standard Specifications and these special provisions.

Concrete backfill for alternative culverts shall be constructed in conformance with the provisions in Section 66-1.045, "Concrete Backfill," of the Standard Specifications.

MEASUREMENT AND PAYMENT

Alternative Pipe of the sizes and thicknesses shown in the Bid Schedule will be measured and paid for by the meter as provided in Section 62-1.03, "Measurement," and Section 62-1.04, "Payment," of the Standard Specifications.

Concrete backfill will be measured and paid for by the cubic meter as Minor Concrete Backfill in conformance with the provisions in Section 66-4, "Measurement and Payment," of the Standard Specifications and the following:

A. The quantity of concrete backfill to be paid for, regardless of the kind of culvert and wall thickness of the culvert installed, will be based on the dimensions shown on the plans and the installation of corrugated steel pipe.

REINFORCED CONCRETE PIPE:

Reinforced concrete pipe shall conform to the provisions in Section 65, "Reinforced Concrete Pipe," of the Standard Specifications and these special provisions.

GENERAL

Where embankment will not be placed over the top of the pipe, a relative compaction of not less than 85 percent shall be required below the pipe spring line for pipe installed using Method 1 backfill in trench, as shown on Standard Plan A62D. Where the pipe is to be placed under the traveled way, a relative compaction of not less than 90 percent shall be required unless the minimum distance between the top of the pipe and the pavement surface is the greater of 1.2 meters or one half of the outside diameter of the pipe.

Except as otherwise designated by classification on the plans or in the specifications, joints for culvert and drainage pipes shall conform to the plans or specifications for standard joints.

When reinforced concrete pipe is installed in conformance with the details shown on Standard Plan A62DA, the fifth paragraph of Section 19-3.04, "Water Control and Foundation Treatment," of the Standard Specifications shall not apply.

When solid rock or other unyielding material is encountered at the planned elevation of the bottom of the bedding, shown on Standard Plan A62DA, the material below the bottom of the bedding shall be removed to a depth of 1/50 of the height of the embankment over the top of the culvert, but not less than 150 mm nor more than 300 mm. The resulting trench below the bottom of the bedding shall be backfilled with structure backfill material in conformance with the provisions in Section 19-3.06, "Structure Backfill," of the Standard Specifications. The Outer Bedding shall not be compacted prior to placement of the pipe.

Timber bulkheads shall be constructed and placed across the ends of unconnected reinforced concrete pipe as shown on the plans.

MATERIALS

The concrete for reinforced concrete pipe must contain not less than 280 kg of cementitious material per cubic meter with a water-cementitious material ratio not to exceed 0.35 by weight. Supplementary cementitious material is optional. Reinforcement shall have a minimum cover of 25 mm.

Timbers for bulkheads shall be full sawn, No. 1 grade Douglas fir-Larch.

Timber for bulkheads shall be pressure treated after fabrication in conformance with AWWA Use Category System: UC4B, Commodity Specification A, except that chromated copper arsenate shall not be used. Only one type of preservative shall be used for treating the timber for each separate installation. The application of preservative treatment shall be that recommended for below ground use.

The timber bulkhead members shall be handled in such a manner that prevents damage. Members that are damaged during handling and placing shall be removed and replaced with new members by the Contractor at the Contractor's expense.

MEASUREMENT AND PAYMENT

Reinforced concrete pipe will be measured and paid for by the meter as provided in Section 65-1.09, "Measurement" and 65-1.10, "Payment" of the Standard Specifications.

Compensation for constructing and placing timber bulkheads shall be considered as included in the contract price paid per linear meter for the reinforced concrete pipe involved and no separate payment will be made therefor.

The excavation and backfill below the planned elevation of the bottom of the bedding shown on Standard Plan A62DA will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the Standard Specifications.

10-1.92 CORRUGATED METAL PIPE:

Corrugated steel pipe culverts shall conform to the provisions in Section 66, "Corrugated Metal Pipe," of the Standard Specifications and these special provisions.
Corrugated steel pipe shall be fabricated from zinc-coated steel sheet.

MEASUREMENT AND PAYMENT

Corrugated steel pipe when used for alternative pipe culvert will be measured and paid for by the meter as Alternative Pipe Culvert of the various sizes designated in the Engineer's Estimate as provided in Section 62-1.03, "Measurement," and Section 62-1.04, "Payment," of the Standard Specifications.

10-1.93 OVERSIDE DRAIN:

Steel entrance tapers shall conform to the provisions in Section 69, "Overside Drains," of the Standard Specifications and these special provisions.

Steel entrance tapers shall be fabricated from zinc-coated steel sheet.

MEASUREMENT AND PAYMENT

Steel entrance tapers will be measured and paid for by the unit of the various sizes designated in the Engineer's Estimate as provided in Section 69-1.05, "Measurement" and 69-1.06, "Payment," of the Standard Specifications.

10-1.94 MISCELLANEOUS FACILITIES (ALTERNATIVE FLARED END SECTION):

Alternative flared end sections shall conform to the provisions in Section 70, "Miscellaneous Facilities," of the Standard Specifications and these special provisions.

MEASUREMENT AND PAYMENT

Alternative flared end sections will be measured and paid for by the unit of the various sizes designated in the Engineer's Estimate as provided in Section 70-1.04, "Measurement" and 70-1.05, "Payment," of the Standard Specifications.

10-1.95 ROCK SLOPE PROTECTION:

Rock slope protection and ditch lining shall be placed or constructed in conformance with the provisions in Section 72, "Slope Protection," of the Standard Specifications and these special provisions.

Rock slope protection fabric shall be nonwoven type fabric, Type A or Type B, at the option of the Contractor.

MEASUREMENT AND PAYMENT

Rock slope protection will be measured and paid for by the cubic meter of the class and placement method designated in the Engineer's Estimate as provided in Section 72-2.04, "Measurement" and 72-2.05, "Payment," of the Standard Specifications.

Rock slope protection fabric will be measured and paid for by the square meter as provided in Section 72-2.04, "Measurement" and 72-2.05, "Payment," of the Standard Specifications.

10-1.96 MINOR CONCRETE CURB, CURB AND GUTTER, CURB RAMP AND SIDEWALK:

Concrete curb, curb and gutter, curb ramps and sidewalk shall conform to the provisions in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications and these special provisions.

Curb ramp detectable warning surface shall consist of raised truncated domes constructed or installed on curb ramps in conformance with the details shown on the plans and these special provisions. At the option of the Contractor, the detectable warning surface shall be prefabricated, cast-in-place, or stamped into the surface of the curb ramp. The color of the detectable warning surface shall be yellow conforming to Federal Standard 595B, Color No. 33538.

Prefabricated detectable warning surface shall be in conformance with the requirements established by the Department of General Services, Division of State Architect and be attached in conformance with the manufacturer's recommendations.

Cast-in-place and stamped detectable warning surfaces shall be painted in conformance with the provisions in Section 59-6, "Painting Concrete," of the Standard Specifications.

The finished surfaces of the detectable warning surface shall be free from blemishes. Prior to constructing the cast-in-place or stamping the detectable warning surface, the Contractor shall demonstrate the ability to produce a detectable warning surface conforming to the details shown on the plans and these special provisions by constructing a 600-mm by 600-mm test panel.

The manufacturer shall provide a written 5-year warranty for prefabricated detectable warning surfaces, guaranteeing replacement when there is defect in the dome shape, color

fastness, sound-on-cane acoustic quality, resilience, or attachment. The warranty period shall begin upon acceptance of the contract.

MEASUREMENT AND PAYMENT

The quantities of curb, curb and gutter, sidewalk and curb ramp will be measured and paid for in accordance with the unit of measure designated in the Engineer's Estimate as provided in Section 73-1.07, "Measurement" and 73-1.08, "Payment," of the Standard Specifications.

Full compensation for constructing or furnishing and installing curb ramp detectable warning surfaces shall be considered as included in the contract price paid per cubic meter for minor concrete (curb ramp) and no separate payment will be made therefor.

10-1.97 TYPE BW FENCE AND TYPE WM GATE:

Type BW fence and Type WM gate shall conform to the provisions in Section 80, "Fences," of the Standard Specifications and these special provisions.

The fence material shall be fastened to metal posts.

Mortar for filling post pockets at the concrete barrier must conform to the provisions in Section 51-1.135, "Mortar," of the Standard Specifications. Full compensation for mortar is included in the contract price paid per meter for Fence (Type BW, 3-Strand) (Barrier-Mounted) and no additional compensation will be allowed.

MEASUREMENT AND PAYMENT

Barbed wire fence will be measured and paid for by the meter of the various types designated in the Engineer's Estimate as provided in Section 80-3.03, "Measurement" and 80-3.04, "Payment," of the Standard Specifications.

Wire mesh gates will be measured and paid for by the unit of the type designated in the Engineer's Estimate as provided in Section 80-3.03, "Measurement" and 80-3.04, "Payment," of the Standard Specifications.

10-1.98 FENCE (WOOD):

Wood fence shall conform to the details shown on the plans and the requirements specified in Section 80, "Fences," of the Standard Specifications, as directed by the Engineer and these special provisions.

Wood posts and rails shall be Douglas fir conforming to the provisions in Section 80-3.01B(1), "Untreated Wood Posts and Braces," of the Standard Specifications.

Exposed wood surfaces shall be primed and painted 2 white finish coats in conformance to the provisions in Section 91-3, "Paints for Timber," of the Standard Specifications.

Posts shall be set in mortar footings conforming to the details shown on the plans and crowned at the top to shed water. Mortar shall comply with the requirements in Section 51-1.35, "Mortar," of the Standard Specifications. At the Contractor's option, commercial quality concrete with 9.5 mm maximum aggregate size may be used for setting posts.

MEASUREMENT AND PAYMENT

Fence (wood) will be measured by the meter from end to end along the face of the fence. The contract price paid per meter for fence (wood) shall include full compensation for furnishing all labor, materials (including mortar or commercial quality concrete and paint), tools, equipment and incidentals, and for doing all the work involved in constructing fence (wood), complete in place, as shown on the plans, including painting, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.99 SURVEY MONUMENTS:

Survey monuments shall be constructed in conformance with the provisions in Section 81, "Monuments," of the Standard Specifications and these special provisions.

Concrete shall be Class 3 or minor concrete at the option of the Contractor.

The cast steel and gray cast iron frames and covers, including hardware, shall conform to the provisions in Section 55-2, "Materials," of the Standard Specifications.

PAYMENT

Survey monuments will be measured by the unit as Survey Monument (Type D) determined from actual count of units installed in place in accordance with the provisions in Section 81-1.06, "Payment," of the Standard Specifications.

10-1.100 METAL BEAM GUARD RAILING:

Metal beam guard railing shall be constructed in conformance with the provisions in Section 83-1, "Railings," of the Standard Specifications and these special provisions. Attention is directed to "Order of Work" of these special provisions.

Line posts shall be wood, steel, or plastic. Blocks shall be wood or plastic.

MEASUREMENT AND PAYMENT

Metal beam guard railing will be measured and paid for by the meter as provided in Section 83-1.03, "Measurement" and 80-1.04, "Payment," of the Standard Specifications.

ALTERNATIVE IN-LINE TERMINAL SYSTEM

Alternative in-line terminal system shall be furnished and installed as shown on the plans and in conformance with these special provisions.

The allowable alternatives for an in-line terminal system shall consist of one of the following or a Caltrans Department approved equal.

- (1) TERMINAL SYSTEM (TYPE SKT) - Terminal system (Type SKT) shall be a SKT 350 Sequential Kinking Terminal manufactured by Road Systems, Inc., located in Big Spring, Texas, and shall include items detailed for terminal system (Type SKT) shown on the plans. The SKT 350 Sequential Kinking Terminal can be obtained from the distributor, Universal Industrial Sales, P.O. Box 699, Pleasant Grove, UT 84062, Telephone (801) 785-0505 or from the distributor, Gregory Highway Products, 4100 13th Street, S.W., Canton, OH 44708, Telephone (330) 477-4800.
- (2) TERMINAL SYSTEM (TYPE ET) - Terminal system (Type ET) shall be an ET-2000 PLUS (4-tube system) extruder terminal as manufactured by Trinity Industries, Inc., and shall include items detailed for terminal system (Type ET) shown on the plans. The ET-2000 PLUS (4-tube system) extruder terminal can be obtained from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, Telephone (800) 772-7976.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that the terminal systems furnished conform to the contract plans and specifications, conform to the prequalified design and material requirements, and were manufactured in conformance with the approved quality control program.

Terminal systems shall be installed in conformance with the manufacturer's installation instructions and these requirements. Each terminal system installed shall be identified by painting the type of terminal system in neat black letters and figures 60 mm high on the backside of the rail element between system posts numbers 4 and 5.

For terminal system (Type ET) the steel foundation tubes with soil plates attached shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. The wood terminal posts shall be inserted into the steel foundation tubes by hand and shall not be driven. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood terminal posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

For terminal system (Type SKT) the soil tubes shall be, at the Contractor's option, driven with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. Wood posts shall be inserted into the steel foundation tubes by hand. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the terminal system has been installed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

MEASUREMENT AND PAYMENT

Alternative flared terminal system will be measured and paid for by the unit of the actual units installed in place.

The contract unit price paid for alternative in-line terminal system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing alternative in-line terminal system, complete in place, including excavation, backfill and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.101 ALTERNATIVE FLARED TERMINAL SYSTEM:

Alternative flared terminal system shall be furnished and installed as shown on the plans and in conformance with these special provisions.

The allowable alternatives for a flared terminal system shall consist of one of the following or a Caltrans Department approved equal.

- (1) **TERMINAL SYSTEM (TYPE FLEAT)** - Terminal system (Type FLEAT) shall be a Flared Energy Absorbing Terminal 350 manufactured by Road Systems, Inc., located in Big Spring, Texas, and shall include items detailed for terminal system (Type FLEAT) shown on the plans. The Flared Energy Absorbing Terminal 350 can be obtained from the distributor, Universal Industrial Sales, P.O. Box 699, Pleasant Grove, UT 84062, Telephone (801) 785-0505 or from the distributor, Gregory Highway Products, 4100 13th Street, S.W., Canton, OH 44708, Telephone (330) 477-4800.
- (2) **TERMINAL SYSTEM (TYPE SRT)** - Terminal system (Type SRT) shall be an SRT-350 Slotted Rail Terminal (8-post system) as manufactured by Trinity Industries, Inc., and shall include items detailed for terminal system (Type SRT) shown on the plans. The SRT-350 Slotted Rail Terminal (8-post system) can be obtained from the manufacturer, Trinity Industries, Inc., P.O. Box 99, 950 West 400S, Centerville, UT 84014, Telephone (800) 772-7976.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that the terminal systems furnished conform to the contract plans and specifications, conform to the prequalified design and material requirements, and were manufactured in conformance with the approved quality control program.

Terminal systems shall be installed in conformance with the manufacturer's installation instructions and these requirements. Each terminal system installed shall be identified by

painting the type of terminal system in neat black letters and figures 60 mm high on the backside of the rail element between system posts numbers 4 and 5.

For terminal system (Type SRT), the steel foundation tubes with soil plates attached shall be, at the Contractor's option, either driven, with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. The wood terminal posts shall be inserted into the steel foundation tubes by hand and shall not be driven. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood terminal posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

For terminal system (Type FLEAT), the soil tubes shall be, at the Contractor's option, driven with or without pilot holes, or placed in drilled holes. Space around the steel foundation tubes shall be backfilled with selected earth, free of rock, placed in layers approximately 100 mm thick and each layer shall be moistened and thoroughly compacted. Wood posts shall be inserted into the steel foundation tubes by hand. Before the wood terminal posts are inserted, the inside surfaces of the steel foundation tubes to receive the wood posts shall be coated with a grease which will not melt or run at a temperature of 65°C or less. The edges of the wood posts may be slightly rounded to facilitate insertion of the post into the steel foundation tubes.

Surplus excavated material remaining after the terminal system has been installed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

MEASUREMENT AND PAYMENT

Alternative flared terminal system will be measured and paid for by the unit of the actual units installed in place.

The contract unit price paid for alternative flared terminal system shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing alternative flared terminal system, complete in place, including excavation, backfill and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.102 CABLE RAILING:

Cable railing shall conform to the provisions in Section 83-1, "Railings," of the Standard Specifications and these special provisions.

MEASUREMENT AND PAYMENT

Cable railing will be measured and paid for by the meter in accordance with the provisions in Section 83-1.03, "Measurement," and 83-1.04, "Payment," of the Standard Specifications.

10-1.103 CONCRETE BARRIER:

Concrete barriers shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

Concrete barriers shall be constructed on a layer of Class 2 Aggregate Base as shown on the plans. Aggregate base shall conform to the provisions in "Aggregate Base" of these special provisions. When concrete barriers are to be constructed on aggregate base, the height of the barriers shall be adjusted to compensate for irregularities in the surface of the finished aggregate base. The amount of adjustment will be determined by the Engineer and will be ordered before the concrete is placed.

Concrete barrier markers shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions. At those locations shown on the plans, concrete barrier markers shall be cemented to the barrier in conformance with the manufacturer's recommendations.

MEASUREMENT AND PAYMENT

Concrete barriers of the various types designated in the Engineer's Estimate will be measured and paid for by the meter in accordance with the provisions in Section 83-2.03, "Measurement," and 83-2.04, "Payment," of the Standard Specifications.

10-1.104 CONCRETE BARRIER (TYPE K):

Concrete barrier (Type K) shall conform to the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

Concrete barrier (Type K) shall consist of precast units conforming to the provisions for temporary railing (Type K) in Section 12-3.08, "Temporary Railing (Type K)," of the Standard Specifications, except that removable panels shall not be used and the concrete barrier (Type K) shall remain in place at the completion of the contract.

Temporary railing (Type K) reflectors on concrete barrier (Type K) shall conform to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions.

MEASUREMENT AND PAYMENT

Concrete barrier (Type K) will be measured and paid for by the meter in accordance with the provisions in Section 83-2.03, "Measurement," and 83-2.04, "Payment," of the Standard Specifications.

Full compensation for furnishing and installing temporary railing (Type K) reflectors on concrete barrier (Type K) shall be considered as included in the contract price paid per meter for concrete barrier (Type K) and no additional compensation will be allowed therefor.

10-1.105 TRANSITION RAILING (TYPE WB):

Transition railing (Type WB) shall be furnished and installed in conformance with details shown on the plans, the provisions in Section 83-2, "Barriers," of the Standard Specifications and these special provisions.

The 10-gage rail elements shall conform to the requirements of Class B, Type 1 three beam guard railing as shown in AASHTO Designation: M 180. End caps shall conform to the requirements of Class A, Type 1 three beam guard railing as shown in AASHTO Designation: M 180.

The 10-gage rail elements shall conform to Class B, Type 2 three beam guard railing as shown in AASHTO Designation: M 180. Other rail elements including end caps shall conform to the requirements of Class A, Type 2 three beam guard railing as shown in AASHTO Designation: M 180.

Surplus excavated material remaining after the transitional railing (Type WB) has been constructed shall be disposed of in a uniform manner along the adjacent roadway where designated by the Engineer.

MEASUREMENT AND PAYMENT

Transition railing (Type WB) will be measured and paid for by the unit of the actual units installed in place.

The contract unit price paid for transition railing (Type WB) shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing transition railing (Type WB), complete in place, including drilling holes for wood posts, driving posts, backfill, and disposal of surplus material, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.106 CRASH CUSHION, SAND FILLED:

Sand filled crash cushions shall be furnished and installed as shown on the plans and in conformance with these special provisions.

A sand filled crash cushion shall consist of a grouping of sand filled modules.
Crash cushions shall be installed at the following locations:

- _____ E. Newport Rd _____.
- _____.
- _____.

At the Contractor's option, modules for use in sand filled crash cushions shall be either Energite III Inertial Modules, Fitch Inertial Modules or Traffix Sand Barrels manufactured after March 31, 1997, or equal:

1. Energite III and Fitch Inertial Modules, manufactured by Energy Absorption Systems, Inc., 35 East Wacker Drive, Suite 1100, Chicago, IL 60601:
 - 1.1. Northern California: Traffic Control Service, Inc., 8585 Thys Court, Sacramento, CA 95828, telephone (800) 884-8274, FAX (916) 387-9734
 - 1.2. Southern California: Traffic Control Service, Inc., 1818 E. Orangethorpe, Fullerton, CA 92831-5324, telephone (800) 222-8274, FAX (714) 526-9501
2. Traffix Sand Barrels, manufactured by Traffix Devices, Inc., 220 Calle Pintoresco, San Clemente, CA 92672, telephone (949) 361-5663, FAX (949) 361-9205
 - 2.1. Northern California: United Rentals, Inc., 1533 Berger Drive, San Jose, CA 95112, telephone (408) 287-4303, FAX (408) 287-1929
 - 2.2. Southern California: Statewide Safety & Sign, Inc., P.O. Box 1440, Pismo Beach, CA 93448, telephone (800) 559-7080, FAX (805) 929-5786

Modules contained in the crash cushion shall be of the same type at each location. The color of the modules shall be the standard yellow color as furnished by the vendor, with black lids. The exterior components of the modules shall be formulated or processed to resist deterioration from ambient ultraviolet rays. The modules shall exhibit good workmanship free from structural flaws and objectionable surface defects.

The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications. The Certificate of Compliance shall certify that the crash cushions comply with the contract plans and specifications, conform to the prequalified design and material requirements, and were manufactured in conformance with the approved quality control program.

Sand for filling the modules shall be clean washed concrete sand of commercial quality. At the time of placing in the modules, the sand shall contain not more than 7 percent water, as determined by California Test 226.

Modules placed on bridge decks shall be provided with positioning blocks fastened to the deck surface. Positioning blocks shall be shaped as segments of a ring and placed along the inner or outer periphery of the module wall. A minimum of 2 blocks, a minimum of one-sixth of a ring in length shall be provided for each module. Positioning blocks and fasteners shall be of a material that is corrosion and water resistant.

Module cylinders shall be filled with sand in conformance with the manufacturer's directions and to the sand capacity in kilograms for each module shown on the plans. Lids shall be securely attached as recommended by the manufacturer.

A Type R or Type P marker panel shall be attached to the front of the crash cushion as shown on the plans, when the closest point of the crash cushion array is within 3.6 m of the traveled way. The marker panel, when required, shall be firmly fastened to the crash cushion with commercial quality hardware or by other methods approved by the Engineer. Sand filled crash cushions, regardless of the number of modules required in each sand filled crash cushion, will be measured and paid for by the unit as crash cushion, sand filled. The

quantity to be paid for will be determined from actual count of the units in place in the completed work.

The contract unit price paid for crash cushion, sand filled shall include full compensation for furnishing all labor, materials (including sand and marker panels), tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing crash cushions, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.107 THERMOPLASTIC TRAFFIC STRIPE AND PAVEMENT MARKING:

Thermoplastic traffic stripes (traffic lines) and pavement markings shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification PTH-02ALKYD.

Retroreflectivity of the thermoplastic traffic stripes and pavement markings shall conform to the requirements in ASTM Designation: D 6359-99. White thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of $250 \text{ mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$. Yellow thermoplastic traffic stripes and pavement markings shall have a minimum initial retroreflectivity of $150 \text{ mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$.

Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

Thermoplastic traffic stripes shall be applied at the minimum thickness and application rate as specified below. The minimum application rate is based on a solid stripe of 100 mm in width.

Minimum Stripe Thickness (mm)	Minimum Application Rate (kg/m)
2.0	0.4
2.5	0.5

Thermoplastic traffic stripes and pavement markings shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

At the option of the Contractor, permanent traffic striping and pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of the thermoplastic traffic stripes and pavement markings specified herein. Permanent tape, if used, shall be installed in conformance with the manufacturer's specifications.

If permanent tape is placed instead of thermoplastic traffic stripes and pavement markings, the tape will be measured and paid for by the meter as thermoplastic traffic stripe and by the square meter as thermoplastic pavement marking.

MEASUREMENT AND PAYMENT

Thermoplastic traffic stripes will be measured and paid for by the meter in accordance with the provisions in Section 84-2.05, "Measurement," and 84-2.06, "Payment," of the Standard Specifications.

Thermoplastic pavement marking will be measured and paid for by the square meter in accordance with the provisions in Section 84-2.05, "Measurement," and 84-2.06, "Payment," of the Standard Specifications.

10-1.108 THERMOPLASTIC TRAFFIC STRIPE (SPRAYABLE):

Sprayable thermoplastic traffic stripes (traffic lines) shall be applied in conformance with the provisions in Section 84, "Traffic Stripes and Pavement Markings," of the Standard Specifications and these special provisions.

Sprayable thermoplastic material shall be free of lead and chromium, and shall conform to the requirements in State Specification No. PTH-02SPRAY.

Retroreflectivity of the sprayable traffic stripes shall conform to the requirements in ASTM Designation: D 6359-99. White sprayable thermoplastic traffic stripes shall have a minimum initial retroreflectivity of $250 \text{ mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$. Yellow sprayable thermoplastic traffic stripes shall have a minimum initial retroreflectivity of $150 \text{ mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$.

At the option of the Contractor, permanent traffic striping and pavement marking tape conforming to the provisions in "Prequalified and Tested Signing and Delineation Materials" of these special provisions may be placed instead of the sprayable thermoplastic traffic stripes. Permanent tape, if used, shall be installed in conformance with the manufacturer's specifications.

Where striping joins existing striping, as shown on the plans, the Contractor shall begin and end the transition from the existing striping pattern into or from the new striping pattern a sufficient distance to ensure continuity of the striping pattern.

Sprayable thermoplastic material shall be applied to the pavement at a minimum thickness of one millimeter and a minimum rate of 0.2-kg/m. The minimum application rate is based on a solid stripe of 100 mm in width.

Sprayable thermoplastic material shall be applied to the pavement at a temperature between 177°C and 205°C, unless a different temperature is recommended by the manufacturer. Sprayable thermoplastic traffic stripes shall be free of runs, bubbles, craters, drag marks, stretch marks, and debris.

If permanent tape is placed instead of sprayable thermoplastic traffic stripes, the tape will be measured and paid for by the meter as thermoplastic traffic stripe (sprayable).

Sprayable thermoplastic traffic stripes will be measured by the meter along the line of the traffic stripes, without deductions for gaps in broken traffic stripes. A double traffic stripe, consisting of two 100-mm wide yellow stripes, will be measured as one traffic stripe.

MEASUREMENT AND PAYMENT

Thermoplastic traffic stripe (Sprayable) will be measured and paid for by the meter in the same manner specified for thermoplastic stripes as provided in Section 84-2.05, "Measurement," of the Standard Specifications.

The contract price paid per meter for thermoplastic traffic stripe (sprayable) shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in applying sprayable thermoplastic traffic stripes (regardless of the number, widths, and patterns of individual stripes involved in each traffic stripe) including establishing alignment for stripes, and layout work, complete in place, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

10-1.109

PAVEMENT MARKERS:

Pavement markers shall be placed in conformance with the provisions in Section 85, "Pavement Markers," of the Standard Specifications and these special provisions.

The Contractor shall furnish the Engineer certificates of compliance for the pavement markers in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Retroreflective pavement markers shall be marked as abrasion resistant on the body of the markers.

MEASUREMENT AND PAYMENT

Pavement markers of the various types designated in the Engineer's Estimate will be measured and paid for by the unit as provided in Section 85-1.08, "Measurement," and 85-1.09, "Payment," of the Standard Specifications.

10-1.110

PREPARING PLANTING AREAS:

Graded Cultivated areas shall conform to Section 20-4.03, Prepare Planting Areas of the standard specifications and these special provisions.

Graded Cultivated areas shall be cultivated as shown on the plans and as directed by the engineer.

PAYMENT

Full compensation for graded cultivated areas shall be included in the contract unit price for Erosion Control (BSM) and Rolled Erosion Control Product (Blanket) and shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in preparing the graded cultivated areas as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer

10-1.111

HIGHWAY PLANTING:

The work performed in connection with highway planting shall conform to the provisions in Section 20-4, "Highway Planting," of the Standard Specifications and these special provisions.

SECTION 10-2. (BLANK)

SECTION 10-3. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

10-3.01 DESCRIPTION:

Traffic signals and lighting shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these special provisions.

Traffic signal work shall be performed at the following locations:

- A. Scott Road/Washington Street (Location 1)
- B. SR 79/Garbani Road (Location 2)
- C. SR 79 /Holland Road (Location 3)
- D. SR 79 /Construction Road (Location 4)

10-3.02 COST BREAK-DOWN::

Cost break-downs shall conform to the provisions in Section 86-1.03, "Cost Break-Down," of the Standard Specifications and these special provisions.

The Engineer shall be furnished a cost break-down for each contract lump sum item of work described in this Section 10-3.

The cost break-down shall be submitted to the Engineer for approval within **15** days after the contract has been approved. The cost break-down shall be approved, in writing, by the Engineer before any partial payment for the items of electrical work will be made.

10-3.03 EQUIPMENT LIST AND DRAWINGS:

The controller cabinet schematic wiring diagram and intersection sketch shall be combined into one drawing, so that, when the cabinet door is fully open, the drawing is oriented with the intersection.

A maintenance manual shall be furnished for all controller units, auxiliary equipment, and vehicle detector sensor units, control units, and amplifiers. The maintenance manual and operation manual may be combined into one manual. The maintenance manual or combined maintenance and operation manual shall be submitted at the time the controllers are delivered for testing or, if ordered by the Engineer, prior to purchase. The maintenance manual shall include, but need not be limited to, the following items:

- A. Specifications

- B. Design characteristics
- C. General operation theory
- D. Function of all controls
- E. Trouble shooting procedure (diagnostic routine)
- F. Block circuit diagram
- G. Geographical layout of components
- H. Schematic diagrams
- I. List of replaceable component parts with stock numbers

10-3.04

MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS:

Maintaining existing and temporary electrical systems shall conform to the provisions in Section 86-1.06 "Maintaining Existing and Temporary Electrical Systems", of the Standard Specifications and these Special Provisions.

The Contractor shall request prior authorization for each traffic signal system shutdown from the Engineer and coordinated traffic signal system shutdown through the Engineer. Traffic signal system shutdowns shall be limited to periods between the hours of 9:00 A.M. and 3:00 P.M..

The Contractor may request authorization from the Engineer to use temporary overhead conductors for temporary traffic signal operation.

Temporary "Stop" signs furnished and installed shall be 48 inches in size.

Temporary "Stop Ahead" signs furnished and installed shall be equipped with portable flashing beacons as directed by the Engineer.

During beacon shutdowns, existing flashing beacons shall be equipped with portable flashing beacons. Portable flashing beacons shall conform to the provisions in Section 12-3.05, "Portable Flashing Beacons".

If directed by the Engineer, the contractor shall furnish, connect, and maintain a generator to keep traffic signal or flashing beacon system running in normal operation. The Contractor shall coordinate and cooperate with the Caltrans traffic signal operation division in all matters pertaining to the operation of existing traffic signal equipment.

Removing, reinstalling or salvaging shall conform to provisions in Section 86-7 "Removing, Reinstalling or Salvaging Electrical Equipment", of the Standard Specifications and these Special Provisions.

Contractor shall deliver salvaged signal equipment to the nearest Caltrans maintenance yard as directed by the Resident Engineer.

10-3.05

CAST-IN-DRILLED-HOLE CONCRETE PILE FOUNDATIONS:

GENERAL

Summary

This work includes constructing cast-in-drilled-hole concrete pile foundations for traffic signal and lighting standards.

Comply with Section 86-2.03, "Foundations," of the Standard Specifications.

MATERIALS

Concrete must contain not less than 350 kilograms of cementitious material per cubic meter.

CONSTRUCTION

For standards located in sidewalk areas, the pile foundation must be:

1. Placed to final sidewalk grade before the sidewalk is placed
2. Square for the top 100 mm

Use sleeve nuts on Type 1-B standards. The bottom of the base plate of Type 1-B standards must be flush with finished grade.

PAYMENT

Payment for cast-in-drilled-hole concrete pile foundations shall conform to the provisions in Section 86-8, "Payment," of the Standard Specifications.

10-3.06

STANDARDS, STEEL PEDESTALS, AND POSTS:

Standards, steel pedestals, and posts for traffic signal and lighting standards shall conform to the provisions in Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications, "Steel Structures" of these special provisions, and the following requirements.

Steel bolts not designated on the plans as high-strength (HS) or stainless steel shall be for general applications and shall conform to the requirements in ASTM Designation: A 307. Where the plans refer to the side tenon detail at the end of the signal mast arm, the applicable tip tenon detail may be substituted.

The sign mounting hardware shall be installed at the locations shown on the plans.

The sign panels shall be furnished by the Contractor in conformance with the provisions in "Furnish Sign" of these special provisions.

Mast arm mounted street name signs shall be installed on signal mast arms at the locations shown on the plans. The street name signs and mounting hardware (including straps, seals, and saddle brackets) shall be furnished in conformance with the provisions in "Furnish Sign" of these special provisions. The Contractor-furnished hanger assembly shall be similar to that shown for internally illuminated street name signs. The mounting hardware

and sign shall be assembled. The assembly shall be attached to the mast arm using a 19 mm x 0.53 mm stainless steel strap in a manner similar to the strap and saddle bracket method shown on the plans. The band shall be wrapped at least twice around the mast arm, tightened, and secured with a stainless strap seal in the same manner shown for strap and saddle bracket sign mounting. Straps, seals, and saddle brackets shall be furnished by the Contractor. The sign panel shall be leveled and hardware securely tightened.

Handhole reinforcement rings for standards, steel pedestals, and posts shall be continuous around the handholes.

Type 1 standards shall be assembled and set with the handhole on the downstream side of the pole in relation to traffic or as shown on the plans.

All ferrous metal parts of tubular sign structures shall be galvanized and shall not be painted.

10-3.07 **SLIP BASE INSERTS:**

Slip base inserts, for installation between the lighting standards and the foundations, shall conform to the details shown on the plans.

The bottom slip base plate shall be welded to the bottom anchor plate before installation. The top slip base plate shall be drilled and tapped to accept the threaded studs as shown on the plans. The studs shall not be welded to the top slip base plate. The pitch diameter of the threaded holes shall conform to the requirements in ANSI Standard: B1.1, having a Class 2B tolerance. Threaded studs installed in the top slip base plate shall match the holes in the base of the lighting standard.

The optional cast steel plate shall conform to the provisions in Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications.

The combined bottom anchor plate and bottom slip base plate shall be bolted to the foundation. The top slip base plate, without the lighting standard attached, shall be bolted to the bottom slip base plate. Each high-strength bolt shall be torqued to 200 ± 10 N·m. After assembly of the insert, the lighting standard shall be erected and installed on the top slip base plate. During installation the lighting standard shall be properly supported to maintain proper alignment of the insert.

High strength bolts, nuts and flat washers used to connect slip base inserts shall conform to the requirements in ASTM Designation: A 325.

CONDUIT:

Conduit to be installed underground shall be Type 3, Schedule 80, unless otherwise specified. Detector termination conduits shall be Type 3.

The conduit in a foundation and between a foundation and the nearest pull box shall be Type 3, Schedule 80.

Conduit sizes shown on the plans and specified in the Standard Specifications and these special provisions are referenced to metallic type conduit. When rigid non-metallic conduit is required or allowed, the nominal equivalent industry size shall be used as shown in the following table:

Size Designation for Metallic Type Conduit	Equivalent Size for Rigid Non-metallic Conduit
21	20
27	25
41	40
53	50
63	65
78	75
103	100

When a standard coupling cannot be used for joining Type 1 conduit, a UL listed threaded union coupling conforming to the provisions in Section 86-2.05C, "Installation," of the Standard Specifications.

When Type 3 conduit is placed in a trench (not in pavement or under portland cement concrete sidewalk), after the bedding material is placed and the conduit is installed, the trench shall be backfilled to not less than 100 mm above the conduit with minor concrete conforming to the provisions in Section 90-10, "Minor Concrete," of the Standard Specifications. The concrete shall contain not less than 250 kg of cementitious material per cubic meter. The remaining trench shall be backfilled to finished grade with backfill material.

Conduit runs shown on the plans to be located behind curbs may be installed in the street, within 0.9-m of, and parallel with the face of the curb, by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the Standard Specifications. Pull boxes shall be located behind the curb or at the locations shown on the plans.

After conductors have been installed, the ends of conduits terminating in pull boxes, service equipment enclosures, and controller cabinets shall be sealed with an approved type of sealing compound.

10-3.09

PULL BOXES:

Grout shall be placed in the bottom of pull boxes.

Pull boxes shall conform to the provisions in Section 86-2.06, "Pull Boxes", of the Standard Specifications and these Special Provisions.

Traffic pull boxes shall conform to the provisions in Section 86-2.07, "Traffic Pull Boxes", of the Standard Specifications and these Special Provisions.

Pull box covers shall be marked in accordance with Standard Plans ES-8. Pull box covers shall be marked "Caltrans" for projects on State of California right of way.

Pull boxes shall be placed with their tops flush with surrounding finish grade or as directed by the Engineer.

Pull boxes shall be installed behind the curb or as shown on the plans and shall be spaced at no more than 61 meter (200 ft) intervals. The exact locations shall be determined by the Engineer.

Pull boxes installed in unimproved areas, locations not protected by concrete curb and gutter, shall be traffic bearing pull box and marked with Type L markers.

10-3.10

CONDUCTORS AND WIRING:

Splices shall be insulated by "Method B".

Signal Interconnect Cable (SIC) shall be the 6-pair type.

The Contractor shall perform a high-voltage series lighting test consisting of the open circuit voltage of the connected constant current transformer between conductors and ground.

The high-voltage test shall not be performed on existing circuits or equipment. Non-testing of existing circuits and equipment shall not relieve the Contractor from the responsibility for malfunctioning of existing lighting circuits due to the Contractor making splices in or connecting to the circuits and such malfunctions shall be corrected at the Contractor's expense.

10-3.11

SIGNAL INTERCONNECT CABLE:

Signal Interconnect Cable (SIC) shall conform to the provisions in Section 86-2.08E, "Signal Interconnect Cable" of the Standard Specifications and these special provisions.

SIC shall be 6-pair, No. 20 AWG cable unless specified otherwise.

The Contractor shall submit a sample of the proposed SIC to the Engineer for approval prior to installation. The Contractor shall pull SIC, without splices, in new and existing conduits, and pull boxes between controller cabinets. The Contractor shall provide a

minimum of 6' of SIC slack in each pull box, 20' of SIC slack inside the SIC PB adjacent to the controller cabinet, and a minimum of 3' of SIC slack inside the controller cabinet.

The Contractor shall solder each end of SIC conductor to a terminal lug using the hot iron method and connect them to the terminal block inside the controller cabinet in the following order:

Terminal Block No.	SIC Conductor Color Coding (County)	SIC Conductor Color Coding (Caltrans)
1	White (White / Blue pair)	White (Black / White pair)
2	Blue (White / Blue pair)	Black (Black / White pair)
3	White (White / Orange pair)	Red (Black / Red pair)
4	Orange (White / Orange pair)	Black (Black / Red pair)
5	White (White / Green pair)	Brown (Black / Brown pair)
6	Green (White / Green pair)	Black (Black / Brown pair)
7	White (White / Brown pair)	Blue (Black / Blue pair)
8	Brown (White / Brown pair)	Black (Black / Blue pair)
9	White (White / Slate pair)	Green (Black / Green pair)
10	Slate (White / Slate pair)	Black (Black / Green pair)
11	Red (Red / Blue pair)	Yellow (Black / Yellow pair)
12	Blue (Red / Blue pair)	Black (Black / Yellow pair)

10-3.12 BONDING AND GROUNDING:

Bonding and grounding shall conform to the provisions in Section 86-2.10, "Bonding and Grounding," of the Standard Specifications and these special provisions.

Bonding jumpers in standards with handholes and traffic pull box lid covers shall be attached by a UL listed lug using 4.5-mm diameter or larger brass or bronze bolts and shall run to the conduit or bonding wire in the adjacent pull box. The grounding jumper shall be visible after the standard has been installed and the mortar pad and cap have been placed on the foundation.

Standards without handholes shall have bonding accomplished by jumpers attached to UL listed ground clamps on each anchor bolt.

For slip base standards or slip base inserts, bonding shall be accomplished by jumpers attached to UL listed ground clamps on each anchor bolt, or a UL listed lug attached to the bottom slip base plate with a 4.5-mm diameter or larger brass or bronze bolt.

Equipment bonding and grounding conductors are required in conduits, except when the conduits contain only combinations of loop lead-in cable, fiber optic cable, or signal interconnect cable. A No. 8 minimum, bare copper wire shall run continuously in circuits. The bonding wire size shall be increased to match the circuit breaker size in conformance with the Code, or shall be as shown on the plans. Conduits to be installed for future conductors, may omit the copper wire.

Bonding of metallic conduits in metal pull boxes shall be by means of bonding bushings and bonding jumpers connected to the bonding wire running in the conduit system.

10-3.13 **STATE-FURNISHED CONTROLLER ASSEMBLIES:**

The Model 2070 controller assemblies, excluding anchor bolts, will be State-furnished as provided under "Materials" section of these special provisions.

The Contractor shall construct each controller cabinet foundation as shown on the plans for Model 332 cabinets (including furnishing and installing anchor bolts), shall install the controller cabinet on the foundation, and shall make field wiring connections to the terminal blocks in the controller cabinet.

A listing of field conductor terminations, in each State -furnished controller cabinet, will be furnished free of charge to the Contractor.

State forces will maintain controller assemblies. The Contractor's responsibility for maintaining controller assemblies shall be limited to conforming to the provisions in Section 6-1.02, "State -Furnished Materials," of the Standard Specifications.

10-3.14 **VEHICLE SIGNAL FACES AND SIGNAL HEADS:**

Type SV-1-T mountings with 5 sections and SV-2-TD mountings shall be bolted to the standard through the upper pipe fitting in the same manner shown for bolting the terminal compartment.

10-3.15 **LIGHT EMITTING DIODE SIGNAL MODULE:**

GENERAL

Summary

This work includes installing LED signal module. Comply with Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications.

Location of LED signal module is shown on the plans. The Engineer will approve exact location.

Use LED signal module as the light source for the following traffic signal faces:

1. 300-mm section
2. 200-mm section
3. 300-mm arrow section
4. 300-mm U-turn section
5. 300-mm bicycle section
6. 300-mm programmed visibility (PV) section
7. 300-mm lane control section

Submittals

Before shipping LED signal modules to job site, submit the following to the Transportation Laboratory:

1. Delivery form including district number, EA, and contact information
2. List containing all LED signal module serial numbers anticipated for use
3. LED signal modules

Quality Control and Assurance

Module must be one listed on the Pre-Qualified Products List for LED traffic signals at:

http://www.dot.ca.gov/hq/esc/approved_products_list

The State will test LED signal module shipments as specified in ANSI/ASQ Z1.4.. Testing will be completed within 30 days of delivery to the Transportation Laboratory. LED signal modules tested or submitted for testing must be representative of typical production units. LED and circular LED signal modules will be tested as specified in California Test 604. Arrow, U-turn, and bicycle LED signal modules will be tested as specified in California Test 3001. All parameters of the specification may be tested on the modules. LEDs must be spread evenly across the module. LED arrow indication must provide the minimum initial luminous intensity listed. Measurements will be performed at the rated operating voltage of 120 V(ac).

Delays resulting from submittal of non-compliant materials do not relieve you from executing the contract within the allotted time. Non-compliant materials will be rejected. You must resubmit new LED for retesting and pick up the failed units within 7 days of notification. You must provide new LED signal modules and allow a minimum of 30 days for the retest. You must pay for all shipping and handling costs related to testing and retesting. Delays resulting from resubmittal and retesting are your responsibility and no extra time will be allowed.

After testing, you must pick up the tested LED signal modules from the Transportation Laboratory and deliver to the job site.

Warranty

The manufacturer must provide a written warranty against defects in materials and workmanship for LED signal modules for a minimum period of 48 months after installation of LED signal modules. Replacement LED signal modules must be provided within 15 days after receipt of failed LED modules at your expense. All warranty documentation must be submitted to the Engineer before installation. Replacement LED signal modules must be delivered to State Maintenance Electrical Shop at 175 Cluster Street, San Bernardino, CA 92408.

MATERIALS

Minimum power consumption for LED signal module must be 5 W.

LED signal module must have an operational lifecycle rating of 48 months. During the operational lifecycle, LED signal module must meet all parameters of this specification.

LED signal module must be designed for installation in the door frame of standard traffic signal housing.

LED signal module must:

1. Be 1.8 kg maximum mass
2. Be manufactured for 300-mm circular, arrow, U-turn, bicycle, and lane control section
3. Be from the same manufacturer
4. Be the same model for each size
5. Be sealed units with:
 - 5.1. 2 color-coded conductors for power connection, except for lane control LED signal modules use 3 color-coded conductors.
 - 5.2. Printed circuit board and power supply contained inside and complying with Chapter 1, Section 6 of TEES published by the Department.
 - 5.3. Lens that is:
 - 5.3.1. Integral to the units
 - 5.3.2. Convex or flat with a smooth outer surface
 - 5.3.3. Made of UV stabilized plastic or glass, and withstands UV exposure from direct sunlight for 48 months without exhibiting evidence of deterioration
 - 5.4. 1-piece EPDM gasket
6. Include 1-meter long conductors with quick disconnect terminals attached as specified in Section 86-4.01C, "Electrical Components," of the Standard Specifications
7. Be sealed in door frames
8. Fit into existing traffic signal section housing and comply with ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads"

Individual LEDs must be wired so catastrophic loss or failure of 1 LED will not result in loss of more than 5 percent of the signal module light output. Failure of an individual LED in a string must not result in loss of entire string or other indication.
No special tools for installation are allowed.

300-mm Arrow

Comply with Section 9.01 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads" for arrow indications.

300-mm U-turn

Symbol is an inverted "U" with arrow on left end and is 24 mm wide. Approximate shape and size for the U-turn face is shown on the plans.

300-mm Bicycle

Approximate shape and size for the bicycle signal face is shown on the plans.

300-mm Lane Control

Combination module with a red X and green arrow. Approximate shape and size for lane control modules is shown on the plans. Conductor function and color code must be as follows:

Conductor Function and Color Code

Function	Color
Neutral	White
Red X	Red
Green Arrow	Brown

LED signal module must:

1. Be weather tight and connect directly to electrical wiring.
2. Be capable of optical unit replacement.
3. Be a single, self-contained device, ready for installation into traffic signal housing.
4. Have manufacturer's name, trademark, model number, serial number, lot number, month and year of manufacture, and required operating characteristics, including rated voltage, power consumption, and volt-ampere, permanently marked on the back of the module.
5. Have a symbol of module type and color. Symbol must be 25 mm in diameter. Color must be written out in 13 mm high letters next to the symbol.
6. Be AlInGaP technology for red and yellow indications and gallium nitride technology for green indications.
7. Be ultra bright type rated for 100,000 hours of continuous operation from -40 °C to +74 °C.
8. Have a maximum power consumption as follows:

Power Consumption Requirements

LED Signal Module Type	Power Consumption (Watts)					
	Red		Yellow		Green	
	25 °C	74 °C	25 °C	74 °C	25 °C	74 °C
300-mm circular	11	17	22	25	15	15
200-mm circular	8	13	13	16	12	12
300-mm arrow	9	12	10	12	11	11
300-mm 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

Lens may be tinted, or may use transparent film or materials with similar characteristics to enhance "ON/OFF" contrasts. Tinting or other materials to enhance "ON/OFF" contrast must not affect chromaticity and must be uniform across the face of the lens.

If polymeric lens is used, surface coating or chemical surface treatment must be applied for front surface abrasion resistance.

Power supply must be integral to the module.

Internal components must be adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Lens and LED signal module material must comply with the ASTM specifications for that material.

Enclosures containing either the power supply or electronic components of LED signal module, except lenses, must be made of UL94VO flame-retardant material.

If a specific mounting orientation is required, the LED signal module must have prominent and permanent vertical markings for accurate indexing and orientation within the signal housing. Markings must include an up arrow, or the word "UP" or "TOP."

LED signal module must meet or exceed the following values when operating at 25 °C:

Minimum Initial Intensities for Circular Indications (cd)

Angle (v,h)	300-mm		
	Red	Yellow	Green
2.5, ±2.5	399	798	798
2.5, ±7.5	295	589	589
2.5, ±12.5	166	333	333
2.5, ±17.5	90	181	181
7.5, ±2.5	266	532	532
7.5, ±7.5	238	475	475
7.5, ±12.5	171	342	342
7.5, ±17.5	105	209	209
7.5, ±22.5	45	90	90
7.5, ±27.5	19	38	38
12.5, ±2.5	59	119	119
12.5, ±7.5	57	114	114
12.5, ±12.5	52	105	105
12.5, ±17.5	40	81	81
12.5, ±22.5	26	52	52
12.5, ±27.5	19	38	38
17.5, ±2.5	26	52	52
17.5, ±7.5	26	52	52
17.5, ±12.5	26	52	52
17.5, ±17.5	26	52	52
17.5, ±22.5	24	48	48
17.5, ±27.5	19	38	38

Minimum Luminance for Arrows, U-turn, Bicycle, Lane Control, and PV Indications (cd/m²)

	Red	Yellow	Green
Arrow Indication	5,500	11,000	11,000
U-turn Indication	5,500	11,000	11,000
Bicycle Indication	5,500	5,500	5,500
Lane Control Indication (X)	5,500	--	--
Lane Control Indication (Arrow)	--	--	5,500
PV Indication (cd at 2.5°±2.5°)	314	314	314

LED signal module must meet or exceed the following illumination values for 48 months when operating over a temperature range of -40 °C to + 74 °C. Yellow LED signal module must meet or exceed the following illumination values for 48 months, when operating at 25 °C:

Minimum Maintained Intensities for Circular Indications (cd)

Angle (v,h)	300-mm		
	Red	Yellow	Green
2.5, ±2.5	339	678	678
2.5, ±7.5	251	501	501
2.5, ±12.5	141	283	283
2.5, ±17.5	77	154	154
7.5, ±2.5	226	452	452
7.5, ±7.5	202	404	404
7.5, ±12.5	145	291	291
7.5, ±17.5	89	178	178
7.5, ±22.5	38	77	77
7.5, ±27.5	16	32	32
12.5, ±2.5	50	101	101
12.5, ±7.5	48	97	97
12.5, ±12.5	44	89	89
12.5, ±17.5	34	69	69
12.5, ±22.5	22	44	44
12.5, ±27.5	16	32	32
17.5, ±2.5	22	44	44
17.5, ±7.5	22	44	44
17.5, ±12.5	22	44	44
17.5, ±17.5	22	44	44
17.5, ±22.5	20	41	41
17.5, ±27.5	16	32	32

Minimum Maintained Luminance for Arrow, U-turn, Bicycle, Lane Control, and PV Indications (cd/m²)

	Red	Yellow	Green
Arrow Indication	5,500	11,000	11,000
U-turn Indication	5,500	11,000	11,000
Bicycle Indication	5,500	5,500	5,500
Lane Control Indication (X)	5,500	--	--
Lane Control Indication (Arrow)	--	--	5,500
PV Indication (at 2.5°±2.5°)	314	314	314

LED signal module must comply with the following chromaticity requirements for 48 months when operating over a temperature range of -40 °C to +74 °C.

Chromaticity Standards (CIE Chart)

Red	Y: not greater than 0.308, or less than 0.998 - x
Yellow	Y: not less than 0.411, nor less than 0.995 - x, nor greater than 0.452
Green	Y: not less than 0.506 - 0.519x, nor less than 0.150 + 1.068x, nor more than 0.730 - x

LED signal module must operate:

1. At a frequency of 60 Hz ± 3 Hz, over a voltage range from 95 V(ac) to 135 V(ac), without perceptible flicker to the unaided eye. Fluctuations of line voltage must have no

- visible effect on luminous intensity of the indications. Rated voltage for measurements must be 120 V(ac).
- Compatible with currently used controller assemblies, including solid state load switches, flashers, and conflict monitors. Comply with TEES Chapters 3 and 6. If a 20 mA alternating current or less is applied to the unit, the voltage read across the 2 leads must be 15 V(ac) or less.

Wiring and terminal block must comply with Section 13.02 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads." Electrical connection for each Type 1 LED signal module must be 2 secured, color-coded, 1-meter long, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wires must comply with NEC, rated for service at +105 °C.

LED signal module on-board circuitry must:

- Include voltage surge protection to withstand high-repetition noise transients. The voltage surge protection must comply with NEMA Standard TS2, Section 2.1.6.
- Comply with FCC, Title 47, SubPart B, Section 15 regulations for Class A emission limits for electronic noise.

LED signal module must provide a power factor of 0.90 or greater.

Total harmonic distortion from current and voltage induced into an alternating current power line by LED signal module must not exceed 20 percent at an operating temperature of 25 °C.

When power is applied to LED signal module, light emission must occur within 90 ms.

Red and Yellow Flashing LED Signal Module

No external circuitry to flash the LED signal module is allowed. Use 12 V(dc) or 120 V(ac).

Flashing LED signal module circuitry must prevent perceptible light emission to the unaided eye when a voltage, 50 V(ac) or less for alternating current or 5 V(dc) for 12 V(dc) flasher units, is applied to the unit.

Electrical connection for each flashing LED signal module must be 4 secured, color-coded, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wire must comply with NEC, rated for service at +105 °C. Conductors for flashing LED signal module must be 1 meter in length, with quick disconnect terminals attached, and must comply with Section 86-4.01C, "Electrical Components," of the Standard Specifications. The color code is as follows:

Color Code Requirements

Function	Color
Neutral/DC common	white
Steady On	red
Flash On	brown
Flash Out	orange

Flashing LED signal module must include all necessary electronics to:

1. Operate in a "Steady On" mode
2. Perform, in "Flash On" mode, 50 to 60 flashes per minute with a 50 percent \pm 5 duty cycle
3. Allow alternating flashing operation, wig-wag, if the "Steady On" input of another flashing LED signal module is connected

When power is applied to the "Flash On" control conductor, the control output must allow a 12 V(dc) or 120 V(ac) signal that is switched opposite of the flash state of the module. Output must be able to source a maximum of 2.5 A for 12 V(dc), or 0.3 A for 120 V(ac). Do not use the power consumption from "Flash Out" output of the flashing LED signal module when determining maximum power consumption.

The flashing LED Signal module must be clearly marked on the back, as "DC FLASHER" or "AC FLASHER", in 13-mm letters.

10-3.16 **PROGRAMMED VISIBILITY VEHICLE TRAFFIC SIGNAL HEADS:**

A signal technician qualified to program the programmed visibility signal heads shall be present at the time the signal heads are placed in operation.

10-3.17 **BATTERY BACKUP SYSTEM:**

GENERAL

Summary

This work includes installing battery backup system (BBS). Comply with Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and TEES.

The State will furnish BBS components as listed in "Materials" of these special provisions. You must furnish the external cabinet and batteries.

Submittals

Before shipping external cabinets to the jobsite, submit material list including contract number, cabinet serial numbers, and contact information to the Transportation Laboratory. Submit a Certificate of Compliance for each external cabinet and batteries to the Engineer under Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

Quality Control and Assurance

The State may test the cabinets.

Functional Testing

After complete installation, BBS functional test must be performed. Test for 30 minutes of continuous, satisfactory operation with utility power turned off. Perform test in the presence of the Engineer.

Warranty

Batteries must be warranted by the manufacturer to operate within a temperature range of -25 °C to +74 °C for 2 years.

Batteries must have a written warranty against defects in materials and workmanship from the manufacturer prorated for a period of 60 months after installation. You must provide the Engineer with all warranty documentation before installation. Replacement batteries must be available within 5 business days after receipt of failed batteries at no cost to the State except the cost of shipping the failed batteries. Replacement batteries must be delivered to Caltrans Maintenance Electrical Shop at 175 Cluster Street, San Bernardino, CA 92408.

MATERIALS

Batteries must:

1. Be deep cycle, sealed prismatic, lead-calcium-based, absorbed-glass mat and valve-regulated lead acid (AGM/VRLA) type
2. Have voltage rating of 12 V
3. Be group size 24
4. Be commercially available and stocked locally
5. Have a carrying handle
6. Be marked with date code, maximum recharge data, and recharge cycles
7. Have 2 top-mounted, threaded, stud posts that include all washers and nuts required for attaching 9.5-mm ring lugs of a State-furnished BBS battery harness
8. Include rubber insulating protective covers for protecting the lugs, posts, and wiring - red for positive terminal and black for negative terminal
9. Be new and fully-charged when furnished
10. Be free from damage or deformities

External cabinet must be one listed on the Pre-Qualified Products List at:

http://www.dot.ca.gov/hq/esc/approved_products_list/

External cabinet must be capable of housing:

1. 4 batteries
2. Inverter/charger unit
3. Power transfer relay
4. Manually-operated bypass switch
5. Required control panels
6. Wiring and harnesses

Dimensions and details for the external cabinet, for attaching the external cabinet to the Model 332A cabinet, and for wiring the State-furnished equipment will be available in an information handout as described in "Project Information" of these special provisions. The following details must comply with Section 86-3.04, "Controller Cabinets," of the Standard Specifications and TEES:

1. Door construction, including material, thickness, coating, and welds

2. Frame
3. Door seals
4. Continuous stainless steel piano hinge or 4 leaves with 2 bolts on each side of each leaf, used to connect the door to external cabinet
5. Padlock clasp or latch and lock mechanism

The external cabinet must be ventilated by using louvered vents, filter, and a thermostatically controlled fan. Fan must be AC-operated from the same line output as the Model 332A cabinet. A 2-position terminal block must be provided on the fan panel, along with 3 meters of connected hookup wire.

The external cabinet surface must be anodized aluminum. Anti-graffiti paint must not be used.

The external cabinet must include all bolts, washers, nuts, and cabinet-to-cabinet coupler fittings necessary for mounting it to the Model 332A cabinet.

Fasteners for the external cabinet must include:

1. 8 cabinet mounting bolts that are 18-8 stainless steel hex head, fully-threaded, and 9.5 mm – 16 x 25.4 mm
2. 2 washers per bolt designed for 9.5-mm bolt and are 18-8 stainless steel 25.4-mm OD round flat type
3. K-lock nut per bolt: K-lock washer that is 18-8 stainless steel and hex-nut

External cabinet to Model 332A cabinet couplings must include a conduit for power connections between the 2 cabinets. Couplings must include:

1. 51-mm nylon-insulated steel chase nipple, T & B 1947 or equivalent
2. 51-mm sealing, steel locknut, T & B 146SL or equivalent
3. 51-mm nylon-insulated steel bushing, T & B 1227 or equivalent

CONSTRUCTION

Mount external cabinet to either the left or right side of Model 332A cabinet. The typical side-mounting location of external cabinet is flush with the bottom of the Model 332A cabinet and approximately equidistant from the front and rear door edges.

MEASUREMENT AND PAYMENT

Full compensation for assembling and installing battery backup system is included in the contract lump sum prices paid for Traffic Signals at various locations, and no separate payment will be made therefor.

LIGHT EMITTING DIODE PEDESTRIAN SIGNAL FACE MODULES:**GENERAL****Summary**

This work includes installing LED pedestrian signal face (PSF) module into standard Type A pedestrian signal housing. Comply with Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications.

Submittals

Before shipping LED PSF modules to job site, submit the following to the Transportation Laboratory:

1. Delivery form including district number, EA, and contact information
2. List containing all LED PSF module serial numbers anticipated for use
3. LED PSF modules

Quality Control and Assurance

Module must be one listed on the Pre-Qualified Products List for LED traffic signals at:

http://www.dot.ca.gov/hq/esc/approved_products_list

The State will test LED PSF module shipments as specified in ANSI/ASQ Z1.4.. Testing will be completed within 30 days of delivery to the Transportation Laboratory. LED PSF modules tested or submitted for testing must be representative of typical production units. LED PSF modules will be tested as specified in California Test 606. All parameters of the specification may be tested on the modules.

Delays resulting from submittal of non-compliant materials do not relieve you from executing the contract within the allotted time. Non-compliant materials will be rejected. You must resubmit new LED for retesting and pick up the failed units within 7 days of notification. You must provide new LED PSF modules and allow a minimum of 30 days for the retest. You must pay for all shipping and handling costs related to testing and retesting. Delays resulting from resubmittal and retesting are your responsibility and no extra time will be allowed.

After successful testing, you must pick up the tested LED PSF modules from the Transportation Laboratory and deliver to the job site.

Warranty

The manufacturer must provide a written warranty against defects in materials and workmanship for LED PSF modules for a minimum period of 48 months after installation of LED PSF modules. Replacement LED PSF modules must be provided within 15 days after receipt of failed LED PSF modules at your expense. The State pays for shipping the failed modules to you. All warranty documentation must be submitted to the Engineer before installation. Replacement LED PSF modules must be delivered to State Maintenance Electrical Shop at 175 Cluster Street, San Bernardino, CA 92408.

MATERIALS

LED PSF module must:

1. Be from the same manufacturer.
2. Be installed in standard Type A pedestrian signal housing, "UPRAISED HAND" and "WALKING PERSON." Do not include reflectors.
3. Use LED as the light source.
4. Be designed to mount behind or replace face plates of standard Type A housing as specified in ITE publication, Equipment and Material Standards, Chapter 3, "Pedestrian Traffic Control Signal Indications" and the "California MUTCD."
5. Have a minimum power consumption of 10 W.
6. Use required color and be ultra bright type rated for 100,000 hours of continuous operation from -40 °C to +74 °C.
7. Be able to replace signal lamp optical units and pedestrian signal faces with both LED and incandescent light sources.
8. Fit into pedestrian signal section housings without modifications to the housing. The housing must comply with ITE publication, Equipment and Materials Standards, Chapter 3, "Pedestrian Traffic Control Signal Heads."
9. Be a single, self-contained device, not requiring on-site assembly for installation into standard Type A housing.
10. Have the following information permanently marked on the back of module:
 - 10.1. Manufacturer's name
 - 10.2. Trademark
 - 10.3. Model number
 - 10.4. Serial number
 - 10.5. Lot number
 - 10.6. Month and year of manufacture
 - 10.7. Required operating characteristics, as follows:
 - 10.7.1. Rated voltage
 - 10.7.2. Power consumption
 - 10.7.3. Volt-ampere (VA)
 - 10.7.4. Power factor
11. Have prominent and permanent vertical markings for accurate indexing and orientation within the signal housing if a specific mounting orientation is required. Markings must include an up arrow, or the word "UP" or "TOP." Marking must be a minimum of 25-mm diameter.

Circuit board and power supply must be contained inside the LED PSF modules. Circuit board must comply with Chapter 1, Section 6 of TEES published by the Department. Individual LEDs must be wired so catastrophic loss or failure of 1 LED will not result in loss of more than 5 percent of the PSF module light output. Failure of an individual LED in a string must not result in the loss of entire string or other indication.

LEDs must be evenly distributed in each indication. Do not use outline forms. No special tools for installation are allowed.

Installation of the LED PSF module into pedestrian signal face must require only removal of lenses, reflectors, lamps, and existing LED modules.

Power supply for LED PSF module must be integral to the module. Power supply for each symbol must be isolated to avoid turn-on conflict.

Assembly and manufacturing processes for LED PSF module must assure that all internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Material used for LED PSF module must comply with ASTM D 3935.

Enclosures containing either the power supply or electronic components of LED PSF module, except lenses, must be made of UL94VO flame-retardant material.

Color of "UPRAISED HAND" symbol must be portland orange.
Color of "WALKING PERSON" symbol must be lunar white.

Each symbol must not be less than 250 mm high and 165 mm wide. Uniformity ratio of illuminated symbols must not exceed 4 to 1 between highest and lowest luminance areas. Symbols must comply with ITE publication, Equipment and Material Standards, Chapter 3, "Pedestrian Traffic Control Signal Indications," and the "California MUTCD."

LED PSF module must maintain an average luminance value over 48 months of continuous use in signal operation for a temperature range of -40 °C to +74 °C. In addition, LED PSF modules must meet or exceed the following luminance values upon initial testing at 25 °C.

Luminance Values

PSF module	Luminance
UPRAISED HAND	3,750 cd/m ²
WALKING PERSON	5,300 cd/m ²

Color output of LED PSF module must comply with chromaticity requirements in Section 5.3 of ITE publication, Equipment and Material Standards, Chapter 3, "Pedestrian Traffic Control Signal Indications."

Measured chromaticity coordinates of LED PSF module must comply with the following chromaticity requirements for 48 months when operating over a temperature range of -40 °C to +74 °C.

Chromaticity Standards (CIE Chart)

UPRAISED HAND (portland orange)	Not greater than 0.390, nor less than 0.331, nor less than 0.997-X
WALKING PERSON (lunar white)	X: not less than 0.280, nor greater than 0.320 Y: not less than 1.055*X - 0.0128, nor greater than 1.055*X + 0.0072

LED PSF module maximum power consumption must not exceed the following values:

Power Consumption Requirements

PSF module	Power Consumption @ 24°C	Power Consumption @ 74°C
UPRAISED HAND	10.0 W	12.0 W
WALKING PERSON	9.0 W	12.0 W

Wiring and terminal block must comply with Section 13.02 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads." The LED PSF module must be supplied with spade lugs and 3 secured, color-coded, 1 meter long, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wires must comply with NEC, rated for service at +105 °C.

LED PSF module must operate:

1. At a frequency of 60 Hz \pm 3 Hz over a voltage range from 95 V(ac) to 135 V(ac) without perceptible flicker to the unaided eye. Fluctuations of line voltage must have no visible effect on luminous intensity of the indications. Rated voltage for measurements must be 120 V(ac).
2. Compatible with currently used State controller assemblies including solid state load switches, flashers, and conflict monitors. Comply with TEES Chapters 3 and 6. If a 20 ma alternating current or less is applied to the unit, the voltage read across the 2 leads must be 15 V(ac) or less.

LED PSF module on-board circuitry must:

1. Include voltage surge protection to withstand high-repetition noise transients. The voltage surge protection must comply with NEMA Standard TS2, Section 2.1.6.
2. Comply with FCC, Title 47, SubPart B, Section 15 regulations for Class A emission limits for electronic noise.

LED PSF module must provide a power factor of 0.90 or greater.

Total harmonic distortion from current and voltage induced into an alternating current power line by LED PSF module must not exceed 20 percent at an operating temperature of 25 °C.

The LED PSF module circuitry must prevent perceptible light emission to the unaided eye when a voltage, 50 V(ac) or less is applied to the unit.

When power is applied to LED PSF module, light emission must occur within 90 ms. The "UPRAISED HAND" and "WALKING PERSON" symbol indications must be electrically isolated from each other. Sharing a power supply or interconnect circuitry between the 2 indications is not allowed.

10-3.19 **DETECTORS:**

Loop detector sensor units will be State-furnished in conformance with the provisions in "Materials" of these special provisions.

Loop wire shall be Type 2.

Loop detector lead-in cable shall be Type B.

For Type E detector loops, sides of the slot shall be vertical and the minimum radius of the slot entering and leaving the circular part of the loop shall be 40 mm. Slot width shall be a maximum of 16 mm. Loop wire for circular loops shall be Type 2. Slots of circular loops shall be filled with hot melt rubberized asphalt sealant.

The depth of loop sealant above the top of the uppermost loop wire in the sawed slots shall be 50 mm, minimum.

Loop sealant shall be the Hot-Melt Rubberized Asphalt sealant type, unless otherwise directed by the Engineer. Loop conductors and sealant shall be installed on the same day the loop slots are cut.

All detector loops shall be tested sequentially by the following methods:

- impedance (measured by megaohms)
- resistance (measured by ohms)
- inductance (measured in microhenries)

10-3.20 **EMERGENCY VEHICLE DETECTOR SYSTEM:**

Each traffic signal shall have an emergency vehicle detector system which shall conform to the details shown on the plans and these special provisions.

GENERAL

Each emergency vehicle detector system shall consist of an optical emitter assembly or assemblies located on the appropriate vehicle and an optical detector/discriminator assembly or assemblies located at the traffic signal.

Emitter assemblies are not required for this project except units for testing purposes to demonstrate that the systems perform as specified. Tests shall be conducted in the presence of the Engineer as described below under "System Operation" during the signal test period. The Engineer shall be given a minimum of 2 working days notice prior to performing the tests.

Each system shall permit detection of 2 classes of authorized vehicles. Class I (mass transit) vehicles shall be detected at ranges of up to 300 m from the optical detector. Class II (emergency) vehicles shall be detected at ranges up to 550 m from the optical detector.

Class I signals (those emitted by Class I vehicles) shall be distinguished from Class II signals (those emitted by Class II vehicles) on the basis of the modulation frequency of the

light from the respective emitter. The modulation frequency for Class I signal emitters shall be $9.639 \text{ Hz} \pm 0.110 \text{ Hz}$. The modulation frequency for Class II signal emitters shall be $14.035 \text{ Hz} \pm 0.250 \text{ Hz}$.

A system shall establish a priority of Class II vehicle signals over Class I vehicle signals and shall conform to the requirements in Section 25352 of the California Vehicle Code.

OPTICAL DETECTION/DISCRIMINATOR ASSEMBLY

General

Each optical detection/discriminator assembly shall consist of one or more optical detectors, connecting cable and a discriminator module.

Each assembly, when used with standard emitters, shall have a range of at least 300 m for Class I signals and 550 m for Class II signals. Standard emitters for both classes of signals shall be available from the manufacturer of the system. Range measurements shall be taken with all range adjustments on the discriminator module set to "maximum".

Optical Detector

Each optical detector shall be a waterproof unit capable of receiving optical energy from two separately aimable directions. The horizontal angle between the 2 directions shall be variable from 180 degrees to 5 degrees.

The reception angle for each photocell assembly shall be a maximum of 8 degrees in all directions about the aiming axis of the assembly. Measurements of reception angle will be taken at a range of 300 m for a Type I emitter and at a range of 550 m for a Type II emitter.

Internal circuitry shall be solid state and electrical power shall be provided by the associated discriminator module.

Each optical detector shall be contained in a housing, which shall include 2 rotatable photocell assemblies, an electronic assembly and a base. The base shall have an opening to permit mounting on a mast arm or a vertical pipe nipple, or suspension from a span wire. The mounting opening shall have female threads for Size 21 conduit. A cable entrance shall be provided which shall have male threads and gasketing to permit a waterproof cable connection. Each detector shall have mass of less than 1.1 kg and shall present a maximum wind load area of 230 cm^2 . The housing shall be provided with weep holes to permit drainage of condensed moisture.

Each optical detector shall be installed, wired and aimed as specified by the manufacturer.

Cable

Optical detector cable (EV-C) shall meet the requirements of IPCEA-S-61-402/NEMA WC 5, Section 7.4, 600-V (ac) control cable, 75°C , Type B, and the following:

- A. The cable shall contain 3 conductors, each of which shall be No. 20 (7 x 28) stranded, tinned copper with low-density polyethylene insulation. Minimum average insulation

- thickness shall be 0.63-mm. Insulation of individual conductors shall be color coded: 1-yellow, 1-blue, 1-orange.
- B. The shield shall be either tinned copper braid or aluminized polyester film with a nominal 20 percent overlap. Where film is used, a No. 20 (7 x 28) stranded, tinned, bare drain wire shall be placed between the insulated conductors and the shield and in contact with the conductive surface of the shield.
 - C. The jacket shall be black polyvinyl chloride with minimum ratings of 600 V (ac) and 80°C and a minimum average thickness of 1.1 mm. The jacket shall be marked as required by IPCEA/NEMA.
 - D. The finished outside diameter of the cable shall not exceed 8.9 mm.
 - E. The capacitance, as measured between any conductor and the other conductors and the shield, shall not exceed 157 pf per meter at 1000 Hz.
 - F. The cable run between each detector and the controller cabinet shall be continuous without splices or shall be spliced only as directed by the detector manufacturer.

Discriminator Module

Each discriminator module shall be designed to be compatible and usable with a Model 170 controller unit and to be mounted in the input file of a Model 332 or Model 336 controller cabinet, and shall conform to the requirements of Chapter I of the State of California, Department of Transportation, "Traffic Signal Control Equipment Specifications."

Each discriminator module shall be capable of operating two channels, each of which shall provide an independent output for each separate input.

Each discriminator module, when used with its associated detectors, shall perform the following:

- A. Receive Class I signals at a range of up to 300 m and Class II signals at a range of up to 550 m.
- B. Decode the signals, on the basis of frequency, at $9.639 \text{ Hz} \pm 0.119 \text{ Hz}$ for Class I signals and $14.035 \text{ Hz} \pm 0.255 \text{ Hz}$ for Class II signals.
- C. Establish the validity of received signals on the basis of frequency and length of time received. A signal shall be considered valid only when received for more than 0.50-second. No combination of Class I signals shall be recognized as a Class II signal regardless of the number of signals being received, up to a maximum of 10 signals. Once a valid signal has been recognized, the effect shall be held by the module in the event of temporary loss of the signal for a period adjustable from 4.5 seconds to 11 seconds in at least 2 steps at $5 \text{ seconds} \pm 0.5 \text{ second}$ and $10 \text{ seconds} \pm 0.5 \text{ second}$.
- D. Provide an output for each channel that will result in a "low" or grounded condition of the appropriate input of a Model 170 controller unit. For Class I signals the output shall be a $6.25 \text{ Hz} \pm 0.1 \text{ percent}$, rectangular waveform with a 50 percent duty cycle. For Class II signals the output shall be steady.

Each discriminator module shall receive electric power from the controller cabinet at either 24 V (dc) or 120 V (ac).

Each channel together with the channel's associated detectors shall draw not more than 100 mA at 24 V (dc) or more than 100 mA at 120 V (ac). Electric power, one detector

input for each channel and one output for each channel shall terminate at the printed circuit board edge connector pins listed below:

BOARD EDGE CONNECTOR PIN ASSIGNMENT

A	DC ground		
B	+24 V (dc)	P	(NC)
C	(NC)		
D	Detector input, Channel A	R	(NC)
E	+24V (dc) to detectors	S	(NC)
F	Channel A output (C)	T	(NC)
		U	(NC)
H	Channel A output (E)	V	(NC)
J	Detector input, Channel B	W	Channel B Output (C)
K	DC Ground to detectors	X	Channel B Output (E)
L	Chassis ground	Y	(NC)
M	AC-	Z	(NC)
N	AC+		

(C) Collector, Slotted for Keying

(E) Emitter, Slotted for Keying

(NC) Not connected, cannot be used by manufacturer for any purpose.

Two auxiliary inputs for each channel shall enter each module through the front panel connector. Pin assignment for the connector shall be as follows:

- A. Auxiliary detector 1 input, Channel A
- B. Auxiliary detector 2 input, Channel A
- C. Auxiliary detector 1 input, Channel B
- D. Auxiliary detector 2 input, Channel B

Each channel output shall be an optically isolated NPN open collector transistor capable of sinking 50 mA at 30 V (ac) and shall be compatible with the Model 170 controller unit inputs.

Each discriminator module shall be provided with means of preventing transients received by the detector from affecting the Model 170 controller assembly.

Each discriminator module shall have a single connector board and shall occupy one slot width of the input file. The front panel of each module shall have a handle to facilitate withdrawal and the following controls and indicators for each channel:

- A. Three separate range adjustments each for both Class I and Class II signals.
- B. A 3-position, center-off, momentary contact switch, one position (down) labeled for test operation of Class I signals, and one position (up) labeled for test operation of Class II signals.
- C. A "signal" indication and a "call" indication each for Class I and for Class II signals. The "signal" indication denotes that a signal above the threshold level has been received. A "call" indication denotes that a steady, validly coded signal has been received. These 2 indications may be accomplished with a single indication lamp; "signal" being denoted by a flashing indication and "call" with a steady indication.

In addition, the front panel shall be provided with a single circular, bayonet-captured, multi-pin connector for 2 auxiliary detector inputs for each channel. Connector shall be a mechanical configuration conforming to the requirements in Military Specification MIL-C-26482 with 10-4 insert arrangement, such as Burndy Trim Trio Bantamate Series, consisting of the following:

- A. Wall mounting receptacle, G0B10-4PNE with SM20M-1S6 gold plated pins.
- B. Plug, G6L10-4SNE with SC20M-1S6 gold plated sockets, cable clamp and strain relief that shall provide for a right angle turn within 65 mm maximum from the front panel surface of the discriminator module.

Cabinet Wiring

The Model 332 cabinet has provisions for connections between the optical detectors, the discriminator module and the Model 170 controller unit.

Wiring for a Model 332 cabinet shall conform to the following:

- A. Slots 12 and 13 of input file "J" have each been wired to accept a 2-channel module.
- B. Field wiring for the primary detectors, except 24-V (dc) power, shall terminate on either terminal board TB-9 in the controller cabinet or on the rear of input file "J," depending on cabinet configuration. Where TB-9 is used, position assignments shall be as follows:

Position	Assignment
4	Channel A detector input, 1st module (Slot J-12)
5	Channel B detector input, 1st module (Slot J-12)
7	Channel A detector input, 2nd module (Slot J-13)
8	Channel B detector input, 2nd module (Slot J-13)

The 24-V (dc) cabinet power will be available at Position 1 of terminal board TB-1 in the controller cabinet.

Field wiring for the auxiliary detectors shall terminate on terminal board TB-O in the controller cabinet. Position assignments are as follows:

FOR MODULE 1 (J-12)		FOR MODULE 2 (J-13)	
Position	Assignment	Position	Assignment
1	+24V (dc) from (J-12E)	7	+24V (dc) from (J-13E)
2	Detector ground From (J-12K)	8	Detector ground from (J-13K)
3	Channel A auxiliary detector input 1	9	Channel A auxiliary detector input 1
4	Channel A auxiliary detector input 2	10	Channel A auxiliary detector input 2
5	Channel B auxiliary detector input 1	11	Channel B auxiliary detector input 1
6	Channel B auxiliary detector input 2	12	Channel B auxiliary detector input 2

SYSTEM OPERATION

The Contractor shall demonstrate that the components of each system are compatible and will perform satisfactorily as a system. Satisfactory performance shall be determined using the following test procedure during the functional test period:

- A. Each system to be used for testing shall consist of an optical emitter assembly, an optical detector, an optical detector cable and a discriminator module.

- B. The discriminator modules shall be installed in the proper input file slot of the Model 170 controller assembly.
- C. Two tests shall be conducted; one using a Class I signal emitter and a distance of 300 m between the emitter and the detector, the other using a Class II signal emitter and a distance of 550 m between the emitter and the detector. Range adjustments on the module shall be set to "Maximum" for each test.
- D. Each test shall be conducted for a period of one hour, during which the emitter shall be operated for 30 cycles, each consisting of a one minute "on" interval and a one minute "off" interval. During the total test period the emitter signal shall cause the proper response from the Model 170 controller unit during each "on" interval and there shall be no improper operation of either the Model 170 controller unit or the monitor during each "off" interval.

10-3.21

WIRELESS CELLULAR DATA COMMUNICATIONS ASSEMBLY:
(CONTRACTOR-FURNISHED)

General

The Contractor shall furnish and deliver one wireless cellular data communications assembly 2 weeks before signal turn on to Caltrans Riverside Electrical Operations, 464 W. Fourth Street, 6th Floor, San Bernardino, CA 92401-1400.

The wireless cellular data communications assembly shall consist of the Code Division Multiple Access (CDMA) modem, an external antenna (for mounting into 334 Controller Cabinet), antenna cable, power supply/adaptor for modem, interface cable between modem and 170/2070 Controller, and modem mounting bracket. The wireless cellular data communications assembly shall provide wireless data transmission between the signal controller in the field and the Caltrans Transportation Management Center (TMC).

CDMA Modem

- The modem shall be product certified by the cellular provider.

RF Specifications:

- 224 mW RF output (+23.5dBm)
- Full duplex transceiver
- Dual band support for both 800 MHz and 1.9 GHz bands
- Adheres to CDMA authentication as specified in CDMA2000

Antenna

- The antenna shall meet the dual band requirements stated above and may be a "pigtail" antenna mounted on the modem antenna connector.

Packet Mode Features:

- The modem shall support data rates up to 150 kbps (forward channel) and 75 kbps (reverse channel)

DC Power Specifications:

- Advanced Power Management features

- Low power consumption
- Input Voltage: 10 VDC to 28 VDC
- Input Current: 40 mA to 200 mA
- Typical Receive: 200 mA at 12 VDC
- Typical Transmit: Approximately 200 mA at 12 VDC
- Dormant connection (idle for 10-20 seconds): 40 mA at 12 VDC
- The above power requirements shall be provided by an AC adapter or other approved devices.

Environmental:

- Operating ranges: -30°C to +70°C (10% duty cycle limit above 60°C)
- Humidity: 5%-95% Non-condensing

Physical Characteristics:

- Weight: Shall be less than 0.5 kg
- Size: Not greater than 78 mm wide x 28 mm high x 130 mm long
- Status LEDs: Shall provide as a minimum indications for power, Received Signal Strength Indication (RSSI), and data transmission error
- RF Antenna Connector: 50 Ohm Terminal Node Controller (TNC)
- Serial Interface: RS232 DB-9F
- Modem Mounting Bracket: Shall attach and secure the modem in the proximity of the 170 Controller: C2 port within the 334 Controller Cabinet

Interface Connection with 170 Controller:

The interconnect cable from the CDMA modem (RS232 DB-9) to the Field Master (FM) 170 Controller's C2 connector shall be no less than 1 meter in length and shall conform to the pin assignment as follows:

<u>DB9M (to external modem)</u>			<u>C2P (to Model 170 Controller)</u> (C2P part number 201355-1)	
<u>Function</u>	<u>Pin</u>	<u>I/F Cable</u>	<u>Pin</u>	<u>Function</u>
Transmit Data	3	<----->	K	Data In
Receive Data	2	<----->	L	Data Out
Signal Ground	5	<----->	N	Ground
Request to Send	7	<----->	J	Request to Send
Clear to Send	8	<----->	M	Clear to Send
Data Terminal Ready	1	<----->	H	Carrier Detect

Installation and Acceptance Testing

Caltrans personnel will install and perform a loop test at the site by transmitting via a cellular device requesting data from the 170 Controller and monitoring the resulting return data under supervision of the Caltrans District electrical operations engineer.

Warranty:

- Minimum 1 year hardware parts

10-3.22 **LUMINAIRES:**

Ballasts shall be the lag or lead regulator, non-regulating reactor, autotransformer or high reactance type.

Luminaires shall be the cutoff type and shall be 200 or 250 Watt High Pressure Sodium Vapor as shown on the construction plans. The fixtures shall be constructed with flat lenses, integral ballasts, and detachable power unit assemblies. The power unit assemblies shall contain the ballast, starter board, capacitors, and a heavy duty terminal block.

10-3.23 **PHOTOELECTRIC CONTROLS:**

Contactors shall be the mechanical armature type.

Photoelectric units for illuminated signs shall have a "turn-on" level of between 215 lux and 323 lux (corresponds to a switching level of approximately 430 lux to 646 lux measured in the horizontal plane). "Turn-off" level shall not exceed 3 times the "turn-on" level.

10-3.24 **REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT:**

Salvaged electrical materials shall be hauled to nearest Caltrans Maintenance yard_ and stockpiled.

The Contractor shall provide the equipment, as necessary, to safely unload and stockpile the material. A minimum notice of 2 business days shall be given prior to delivery.

10-3.25 **PAYMENT:**

The contract **Lump Sum** price or prices paid for Signal and Lighting shall include full compensation for furnishing all labor, materials, tools, equipment, foundations, documents, programming, testing, and incidents and for doing all the work specified herein, elsewhere in these Special Provisions, and plans including the complete installation of an operational traffic signal and lighting system excluding the cost of State Furnished material, and no additional compensation shall be allowed therefor.

The contract lump sum price or prices paid for signal and lighting shall include highway lighting at intersections in connection with signals only.

Other roadway lighting on the project shall be considered as included in the contract lump sum price paid for lighting and sign illumination.

Full compensation for hauling and stockpiling electrical materials shall be considered as included in the contract price paid for the item requiring the material to be salvaged and no additional compensation will be allowed therefor.

If any of the fabrication sites for the materials listed are located more than 480 air line kilometers from both Sacramento and Los Angeles, additional shop inspection expenses will be sustained by the State. Whereas it is and will be impractical and difficult to determine the actual increase in these expenses, it is agreed that payment to the Contractor for furnishing these listed materials from each fabrication site located more than 480 air line kilometers from both Sacramento and Los Angeles will be reduced \$2000:

SECTION 10-4. Standard Plan List

Standard Plans List

The Standard Plan sheets applicable to this contract include, but are not limited to those indicated below. Applicable Revised Standard Plans (RSP) and New Standard Plans (NSP) indicated below are included in the project plans as individual Standard Plan sheets.

GENERAL ROAD WORK (Miscellaneous)

A10A	Acronyms and Abbreviations (A-L)
A10B	Acronyms and Abbreviations (M-Z)
A10C	Symbols (Sheet 1 of 2)
A10D	Symbols (Sheet 2 of 2)
A20A	Pavement Markers and Traffic Lines, Typical Details
A20B	Pavement Markers and Traffic Lines, Typical Details
A20C	Pavement Markers and Traffic Lines, Typical Details
A20D	Pavement Markers and Traffic Lines, Typical Details
A24A	Pavement Markings - Arrows
A24B	Pavement Markings - Arrows
RSP A24C	Pavement Markings - Symbols and Numerals
A24D	Pavement Markings - Words
A24E	Pavement Markings - Words and Crosswalks
A62D	Excavation and Backfill - Concrete Pipe Culverts
A62DA	Excavation and Backfill - Concrete Pipe Culverts
A62F	Excavation and Backfill - Metal and Plastic Culverts
RSP A74	Survey Monuments
RSP A76A	Concrete Barrier Type 60
A76B	Concrete Barrier Type 60
A77A1	Metal Beam Guard Railing - Standard Railing Section (Wood Post with Wood Block)
A77A2	Metal Beam Guard Railing - Standard Railing Section (Steel Post with Notched Wood or Notched Plastic Block)
A77B1	Metal Beam Guard Railing - Standard Hardware
A77C1	Metal Beam Guard Railing - Wood Post and Wood Block Details
A77C2	Metal Beam Guard Railing Steel Post, Notched Wood Block and Notched Plastic Block Details
A77H1	Metal Railing End Anchor Assembly (Type SFT)
A77H2	Metal Railing Rail Tensioning Assembly
A77H3	Metal Railing Anchor Cable and Anchor Plate Details
A77J4	Metal Beam Guard Railing Transition Railing (Type WB)
A77L1	Metal Beam Railing Terminal System (Type SRT)

RSP A81A	Crash Cushion, Sand Filled (Unidirectional)
A82B1	Crash Cushion (Type ADIEM)
A86	Barbed Wire And Wire Mesh Fences
RSP A87A	Curbs and Driveways
RSP A88A	Curb Ramp Details
GENERAL ROAD WORK (Drainage)	
D78A	Gutter Depressions
D94A	Metal and Plastic Flared End Sections
D94B	Concrete Flared End Sections
D97A	Corrugated Metal Pipe Coupling Details No. 1- Annular Coupling Band Bar And Strap and Angle Connections
D97C	Corrugated Metal Pipe Coupling Details No. 3- Helical and Universal Couplers
RSP D97F	Corrugated Metal Pipe Coupling Details No. 6- Positive Joint
GENERAL ROAD WORK (Erosion Control)	
NSP H51	Erosion Control Details (Fiber Roll)
GENERAL ROAD WORK (Temporary Facilities)	
RSP T1A	Temporary Crash Cushion, Sand Filled (Unidirectional)
RSP T1B	Temporary Crash Cushion, Sand Filled (Bidirectional)
RSP T2	Temporary Crash Cushion, Sand Filled (Shoulder Installations)
T3	Temporary Railing (Type K)
T4	Temporary Traffic Screen
RSP T12	Traffic Control System for Lane Closure on Multilane Conventional Highways
RSP T13	Traffic Control System for Lane Closure on Two Lane Conventional Highways
T51	Temporary Water Pollution Control Details (Temporary Silt Fence)
T56	Temporary Water Pollution Control Details (Temporary Fiber Roll)
T57	Temporary Water Pollution Control Details (Temporary Check Dam)
T58	Temporary Water Pollution Control Details (Temporary Construction Entrance)
ROADSIDE SIGNS	
RS1	Roadside Signs, Typical Installation Details No. 1
RS2	Roadside Signs - Wood Post, Typical Installation Details No. 2
RS4	Roadside Signs, Typical Installation Details No. 4
SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS	
RSP ES-1A	Electrical Systems (Symbols And Abbreviations)
RSP ES-1B	Electrical Systems (Symbols And Abbreviations)
RSP ES-1C	Electrical Systems (Symbols And Abbreviations)
RSP ES-2A	Electrical Systems (Service Equipment)
RSP ES-2C	Electrical Systems (Service Equipment Notes, Type III Series)
RSP ES-2D	Electrical Systems (Service Equipment and Typical Wiring Diagram,

	Type III – A Series)
ES-3A	Electrical Systems (Controller Cabinet Details)
RSP ES-3B	Electrical Systems (Controller Cabinet Details)
RSP ES-3C	Electrical Systems (Controller Cabinet Details)
ES-4A	Electrical Systems (Signal Heads and Mountings)
ES-4B	Electrical Systems (Signal Heads and Mountings)
RSP ES-4C	Electrical Systems (Signal Heads and Mountings)
RSP ES-4D	Electrical Systems (Signal Heads and Mountings)
RSP ES-5A	Electrical Systems (Detectors)
ES-5B	Electrical Systems (Detectors)
ES-5C	Electrical Systems (Detectors)
RSP ES-5D	Electrical Systems (Detectors)
RSP ES-7F	Electrical Systems (Signal and Lighting Standard – Case 4 Arm Loading, Wind Velocity = 161 km/h, Arm Lengths 7.6 m to 13.7 m)
RSP ES-7G	Electrical Systems (Signal and Lighting Standard – Case 5 Arm Loading, Wind Velocity = 161 km/h, Arm Lengths 15.2 m to 16.8 m)
RSP ES-7J	Electrical Systems (Signal and Lighting Standard – Advance Flashing Beacons)
RSP ES-7M	Electrical Systems (Signal and Lighting Standards – Details No. 1)
RSP ES-8	Electrical Systems (Pull Box Details)
RSP ES-10	Electrical Systems (Isolux Diagrams)
RSP ES-11	Electrical Systems (Foundation Installations)
RSP ES-13A	Electrical Systems (Splicing Details)
RSP ES-13B	Electrical Systems (Wiring Details and Fuse Ratings)

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10	11	12	13	15	16	17	18	19	20
DATE	REFERENCE NUMBER	DESCRIPTION - OTHER COMMENTS/CHARGES	PRODUCT/ZONE	SIZE	BILLED UNITS	TIMES RUN	RATE	GROSS AMOUNT	NET AMOUNT
08/21/2011	I00599074-08212011	NOTICE TO CONTRACTORS Sealed prc	Press-Enterprise	2 x 77 LI	154	1	1.30	200.20	200.20
08/22/2011	I00599074-08212011	NOTICE TO CONTRACTORS Sealed prc	Press-Enterprise	2 x 77 LI	154	1	1.20	184.80	184.80
08/23/2011	I00599074-08212011	NOTICE TO CONTRACTORS Sealed prc	Press-Enterprise	2 x 77 LI	154	1	1.20	184.80	184.80
08/24/2011	I00599074-08212011	NOTICE TO CONTRACTORS Sealed prc	Press-Enterprise	2 x 77 LI	154	1	1.20	184.80	184.80
08/25/2011	I00599074-08212011	NOTICE TO CONTRACTORS Sealed prc	Press-Enterprise	2 x 77 LI	154	1	1.20	184.80	184.80
08/26/2011	I00599074-08212011	NOTICE TO CONTRACTORS Sealed prc	Press-Enterprise	2 x 77 LI	154	1	1.20	184.80	184.80
08/27/2011	I00599074-08212011	NOTICE TO CONTRACTORS Sealed prc	Press-Enterprise	2 x 77 LI	154	1	1.20	184.80	184.80
08/28/2011	I00599074-08212011	NOTICE TO CONTRACTORS Sealed prc	Press-Enterprise	2 x 77 LI	154	1	1.20	184.80	184.80
08/29/2011	I00599074-08212011	NOTICE TO CONTRACTORS Sealed prc	Press-Enterprise	2 x 77 LI	154	1	1.20	184.80	184.80
08/30/2011	I00599074-08212011	NOTICE TO CONTRACTORS Sealed prc	Press-Enterprise	2 x 77 LI	154	1	1.20	184.80	184.80

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1	6	7	2
BILLING PERIOD	BILLED ACCOUNT NUMBER	ADVERTISER/CLIENT NUMBER	
08/30/2011 - 08/30/2011	100141323	100141323	
23	24	3	3
BALANCE	INVOICE NUMBER	TERMS OF PAYMENT	
\$1,863.40	I00599074-08212011	DUE UPON RECEIPT	



Legal Advertising Invoice

8 BILLING ACCOUNT NAME AND ADDRESS

9 REMITTANCE ADDRESS

BOARD OF SUPERVISORS
P.O. BOX 1147
COUNTY OF RIVERSIDE
RIVERSIDE, CA 92502

Enterprise Media
POST OFFICE BOX 12009
RIVERSIDE, CA 92502-2209

THE PRESS-ENTERPRISE

3450 Fourteenth Street
Riverside, CA 92501-3878
951-684-1200
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Publication(s): Press-Enterprise

PROOF OF PUBLICATION OF

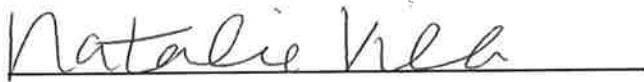
Ad Desc.: /

I am a citizen of the United States. I am over the age of eighteen years and not a party to or interested in the above entitled matter. I am an authorized representative of THE PRESS-ENTERPRISE, a newspaper in general circulation, printed and published daily in the County of Riverside, and which newspaper has been adjudicated a newspaper of general circulation by the Superior Court of the County of Riverside, State of California, under date of April 25, 1952, Case Number 54446, under date of March 29, 1957, Case Number 65673, and under date of August 25, 1995, Case Number 267864; that the notice, of which the annexed is a printed copy, has been published in said newspaper in accordance with the instructions of the person(s) requesting publication, and not in any supplement thereof on the following dates, to wit:

**08/21, 08/22, 08/23, 08/24, 08/25, 08/26, 08/27, 08/28, 08/29,
08/30/2011**

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Date: August 30, 2011
At: Riverside, California



BOARD OF SUPERVISORS
P.O. BOX 1147
COUNTY OF RIVERSIDE
RIVERSIDE, CA 92502

Ad Number: 0000599074-01

P.O. Number:

Ad Copy:

NOTICE TO CONTRACTORS

Sealed proposals will be received at the Riverside County Transportation Department, 14th Street Transportation Annex, 3525 14th Street, Riverside, California 92501, telephone (951) 955-6780 until 2:00 pm on Wednesday, September 21, 2011 at which time they will be publicly opened at said address, for construction in accordance with the specifications therefore, to which special reference is made, as follows:

County of Riverside,
**STATE ROUTE 79 (SR-79) WINCHESTER ROAD
PHASE 1 ROAD WIDENING
FROM SCOTT ROAD TO DOMNIGONI PARKWAY
NORTH OF THE CITY OF MURRIETA**

**PROJECT No. B4-05272
FEDERAL AID NO. STPLN-5956 (197)**

The UDBE Contract goal is 1.2 percent.

A pre-bid meeting is scheduled for 2:15 pm on Wednesday, September 14, 2011, at the County of Riverside Transportation Department, 3525 14th Street, Riverside, California 92501. This meeting is to inform bidders of project requirements and subcontractors of subcontracting and material supply opportunities. Bidder's attendance at this meeting is not mandatory.

THIS PROJECT IS SUBJECT TO THE "BUY AMERICAN" PROVISIONS OF THE SURFACE TRANSPORTATION ASSISTANCE ACT OF 1982 AS AMENDED BY THE INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT OF 1991.

Bids are required for the entire work described herein. The Contractor shall possess a current and active State of California Class "A" Contractor's license at the time this contract is awarded. The successful bidder shall furnish a payment bond and a performance bond.

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

Inquiries or questions based on alleged patent ambiguity of the plans, specifications or estimate must be communicated as a bidder inquiry, in writing, prior to bid opening. Any such inquiries or questions, submitted after bid opening, will not be treated as a bid protest. Technical questions should be directed to the office of the County of Riverside Transportation Department, 3525 14th Street, Riverside, CA 92501, telephone (951) 955-6780, electronic mail: rjrimenez@rcctma.org.

Plans and specifications may be obtained for a **NONREFUNDABLE FEE OF \$150 PER FULL SIZE PLAN SET** (or \$75 PER SMALL SIZE PLAN SET [11"x17"]), plus mailing, and are available at 3525 14th Street, Riverside, CA 92501.

Engineering Estimate	\$18,000,000 - \$22,000,000
Bid Bond	10%
Performance Bond	100%
Payment Bond	100%
Working Days	120

<http://www.rcctma.org/trans/bidadvertisements.html>

Dated: August 18, 2011
Kecia Harper-Ihem, Clerk of the Board
By: Cecilia Gil, Board Assistant 8/21-8/30