

If ordered, furnish resources to assist in the investigation or recovery of archeological resources.

The California Public Resources Code Chapter 1.7, Section 5097.5 makes it a misdemeanor for anyone to knowingly disturb an archeological or historical feature. California Public Resources Code Sections 5097.98 and 5097.99 require protection of Native American remains which may be found and outlines procedures for handling any burials found.

If archeological resources are identified by the Archeological monitor, no clearing and grubbing or grading operations shall be performed within 60 feet until the archeological resource is relocated. The Department reserves the right to use other forces for exploratory work to identify and determine the extent of the area requiring archeological artifact recovery and for removing archeological artifacts from such area. When archeological resources are relocated and the area of the relocation has not completed construction, the archeological resources shall be stored and protected until construction is completed. In other cases, the archeological resources shall be relocated at the new locations, identified by the archeological monitor and the Engineer, the same day the archeological resources are removed. For archeological resources that have been stored and protected, the resources shall be relocated immediately after construction is complete.

Prior to any archeological resource relocation, the Contractor shall take any appropriate measures to minimize damage during transportation.

The Contractor shall determine the methods to be used to relocate archeological resources, including removing, transporting, and storing if required. The Contractor shall submit a proposed plan for this work, in writing, to the Engineer prior to the start of the work. The proposed plan shall include, but not necessarily be limited to, archeological resource size, method of protection during transportation, and final placement methods for each archeological resource relocated.

Add to section 14-2.03A:

Location of AMAs within, near, or straddling the project limits are shown in the following table:

AMA designation and description	
33-021031	Within 200' of the Clinton Keith Road and Menifee Road intersection.
CA-RIV-11739	West of Arendt Lane
CA-RIV-11576	North of station 278+00 to 279+00
CA-RIV-11574/H	South of Station 279+50 to 281+00
CA-RIV-11575	From station 280+50 to 287+00
CA-RIV-11572	At retaining wall No. 290, north of Station 289+50 to 292+50
CA-RIV-11571/H	West bank of Warm Springs Creek, from station 296+00 to 300+00
CA-RIV-11573	East bank of Warm Springs Creek, north of station 303+00 to 304+00

The areas listed above have identified that cultural resources may be encountered during ground-disturbing construction activities. Ground-disturbing activities is defined to include, but not limited to, clearing and grubbing, roadway excavation, structure excavation, scarification of ground surface, grading, and auger boring for the construction of Clinton Keith Road, as well as temporary construction roadways, underground utility installations and temporary construction of Contractor's staging areas.

Contractor is advised that ground-disturbing activities within the entire project limits shall not be undertaken without the presence of an archeological monitor. Ground-disturbing activities within the above identified AMA areas shall not be undertaken without the presence of both an archeological monitor and Native American monitor. The Contractor shall notify the Engineer in writing at least 5 working days prior to the performance of any ground-disturbing activities to facilitate the presence of an archeological monitor and Native American monitor during ground-disturbing activities.

No construction shall occur within an AMA without the presence of an archeological monitor. The Contractor shall notify the Engineer in writing at least 5 working days prior to the construction activities to facilitate the presence of an archeological monitor during construction activities.

Contractor's attention is directed to section 19-3 of these special provisions for additional requirements for Archeological monitoring requirements during structure excavation and backfill of retaining wall no. 290.

Replace 6th paragraph of section 14-2.03A:

If archeological resources are discovered within an AMA, comply with section 14-2.02 and these special provisions.

The California Administrative Code, Title 14, Section 4308, requires that no person disfigure any object of historical interest or value. The California Penal Code, Title 14, Part 1, Section 622-1/2 makes it a misdemeanor to destroy anything of historical value within any public place.

Should human skeletal material or archeological remains be found during construction activities, stop all work within a 60-foot radius of the discovery. The Contractor shall notify the Engineer immediately. Construction activities within 60 feet of the find shall remain halted until the Contractor has been notified that construction in the vicinity of the find may resume. If, in the opinion of the Engineer, the Contractor's operations are delayed or interfered with due to investigations made of the archeological find, the Department will compensate the Contractor for such delays to the extent provided in Section 8-1.07, "Delays," of the Standard Specifications.

Except as provided in said Section 8-1.07, full compensation for conforming to the above requirements shall be considered as included in the contract price paid for the various contract items of work and no additional compensation will be allowed therefor.

Replace section 14-6.02 with:

14-6.02 SPECIES PROTECTION

14-6.02A General

Section 14-6.02 includes specifications for protecting regulated species or their habitat.

This project is within or near identified burrowing owl and special status bat range/habitat. The range/habitat includes areas within the highway right of way. Active breeding season for these species is defined as March 1 and August 15. The Contractor shall not commence ground-disturbing construction activities, during this time period, until notified in writing by the Engineer that said construction activities can proceed. Ground-disturbing activities includes, but is not limited to, clearing and grubbing, excavation, scarification of ground surface, grading, and auger boring.

This project is within or near habitat for regulated species shown in the following table:

Species Name
Bat
Burrowing Owl

14-6.02B Material

Not Used

14-6.02C Construction

14-6.02C(1) Preconstruction Survey and Training Program Requirements

Within 30 days prior to the Contractor's ground-disturbing activities, the Department's biologist will conduct a preconstruction ground sweeping survey of the project site for burrowing owls in suitable

habitat and for identification of potential special status bat roosts. During this period, the Department's biologist will conduct training sessions for Contractor and subcontractor employees, including material suppliers and equipment maintenance personnel in connection with Best Management Practices required under the Western Riverside Multiple Species Habitat Conservation Plan policies.

The Department will retain, and have available, the services of a qualified biologist as specified in these special provisions for a pre-construction sweep of the project site, on-site monitoring, if required, and all exit surveys or relocation handling that may be required.

14-6.02C(2) Protective Radius

Upon discovery of a regulated species, stop construction activities within a 100' radius of the discovery or as defined in the table below. Immediately notify the Engineer. Do not resume activities until receiving notification from the Engineer.

Regulated species name	Protective radius
Bat	300'
Burrowing Owl	100'

14-6.02C(3) Protocols

Not Used

14-6.02C(4) Biological Resource Information

Implement the following biological resource information requirements.

1. Western Riverside Multiple Species Habitat Conservation Plan

14-6.02C(5) Protection Measures

Within species protection area 1, implement the following protection measures:

1. Construction activity allowed by the biologist during the breeding season shall be confined with the areas identified by the biologist that are clear of bat roosts. In the event that active bat roosts have been located, construction activity within 300 feet of the roost will be prohibited until the completion of parturition period (defined as end of August). As an alternative, subject to the biologist's approval, prior to the onset of parturition, roosts may be removed during the evening forage period (within 4 hours after dark) or fitted with one-way exit doors to effectively eliminate and exclude roost.
2. Contractor shall report immediately to the Engineer or to the Department's biologist all sightings of, or encounters with, any bat roosts within the project limits during the period allowed for construction activity in order to determine the proper course of action required to mitigate any potential impact.

14-6.02C(6) Monitoring Schedule

Not Used

14-6.02C(7) Time Extension

If suspension of a work activity is ordered by the Engineer due to an encounter with active bat roosts or burrowing owl nests during the time allowed for construction activities, and if, in the opinion of the Engineer, the Contractor's current controlling operation is delayed or interfered with by reason of the suspension, the delay will be considered a right of way delay as specified in Section 8-1.07, "Delays," of the Standard Specifications.

14-6.02D Payment

Not Used

Add to section 14-7.02A:

Portions of the project site have been identified that paleontological resources may be encountered during ground-disturbing construction activities. Ground disturbance includes, but is not limited to, clearing and grubbing, excavation, scarification of ground surface, grading, and auger boring.

The Department will retain a qualified paleontological monitor to observe all ground-disturbing activities at the following paleontologically sensitive areas:

1. Area between the intersection of proposed Clinton Keith Road and Whitewood Road and 1,300 feet east of this intersection (between Stations 236+00 and 252+00).
2. Within 200' of the Clinton Keith Road and Menifee Road intersection.
3. Location where the proposed Project alignment crosses the older terrace of Warm Springs Creek, represented by its current floodplain.

The Contractor shall notify the Engineer, in writing, at least 5 working days prior to performing any ground-disturbing activities within the above identified areas to facilitate the on-site monitoring by the Department's paleontological monitor during construction operations.

Monitoring will consist of visually inspecting fresh exposures of sediment and dirt generated by the site ground-disturbing construction operations. The monitoring will concentrate on areas and rock units containing fossil sites recorded during the preconstruction survey

All paleontological resources or artifacts found during project activities shall become the property of the County.

The Department reserves the right to use other forces for exploratory work to identify and determine the extent of the area requiring paleontological recovery and for removing fossil resources from such area.

In the event that paleontological resources or artifact is found, and if in the opinion of the Engineer, the Contractor's operations are delayed or interfered with due to assessments and recovery of discovered fossil resources, the Department will compensate the Contractor for such delays to the extent provided in Section 8-1.07, "Delays," of the Standard Specifications.

Replace the 1st paragraph of section 14-8.02 with:

Contractor's attention is directed to section 00-1.23 of these special provisions. If the Engineer approves exceptions to daily work hours, do not exceed 86 dBA LMax at 50 feet from the job site activities from 6:00 p.m. to 6:00 a.m. from June to September, and from 6:00 p.m. to 7:00 a.m. from October to May including holidays within unincorporated Riverside County, and from 7:00 p.m to 7:00 am Monday thru Saturday including holidays within City of Murrieta limits.

Add to section 14-9.02A:

The location of the Clinton Keith Road project is within an area controlled by the South Coast Air Quality Management District (AQMD). The Contractor shall be fully informed of rules, regulations, and conditions that may govern the Contractor's operations in the areas and shall conduct the work accordingly.

Attention is directed to Section SS 23, "Dust Abatement" of the General Conditions regarding dust control actions required by the Contractor.

Replace 1st paragraph of section 14-9.02C with:

The Contractor shall cease all construction activities during first and second stage Smog Alerts as announced by AQMD.

The Contractor shall continually implement to prevent diesel-engine trucks from idling longer than 2 minutes. Days during which the Contractor's operations are restricted by the requirements of this section shall be considered to be nonworking days if these restrictions cause a delay in the current controlling operation or operations.

The Contractor shall implement procedures to prevent diesel-engine trucks from idling longer than 2 minutes.

1. Free of organics, debris, and oversized material
2. Material has an Expansion Index less than 30
3. Material has a Plasticity Index less than 12
4. Material is non-corrosive to steel and concrete

The backfill shall be placed in loose lifts with a maximum thickness of 8 inches, moisture conditioned, as necessary, to optimum moisture content, and compacted to a minimum 95 percent compaction as determined by ASTM D1557.

Add to section 19-2.03D:

At riparian areas located near Warm Springs Creek, stockpile the top 8 inches of topsoil as selected material prior to site disturbance. Selected material topsoil shall be stockpiled away from active construction area and covered with tarps to prevent erosion or seed establishment. Impacted riparian areas will be re-graded to original contours as feasible once construction is complete, stockpiled topsoil will be incorporated and redistributed across riparian area as shown on the plans.

Add to section 19-2.03G:

Roughen embankment slopes to receive erosion control materials by either track-walking or rolling with a sheepsfoot roller. Track-walk slopes by running track-mounted equipment perpendicular to slope contours.

Roughen excavation slopes and flat surfaces to receive erosion control materials by scarifying to a depth of 4 inches.

Add to section 19-3.01A(1):

Contractor's attention is directed to Section 14-2 of these special provisions for archeological monitoring requirements during ground-disturbing and construction activities. Ground-disturbing activities and construction within the archeological monitoring area shall only be done in the presence of the required archeological monitors.

Structure backfill includes constructing the geocomposite drain strip within the backfill or against the native materials, as shown on the plans. Geocomposite drain must comply with section 68-7.

Replace section 19-3.01A(2):

Prior to any ground-disturbing activities within the archeological monitoring area, submit a plan for protecting the potential archeological resources from damage. Damage could occur during excavation, during construction of the retaining wall and during backfill and final grading. The plan must include, but not limited to:

1. Order of work
2. Detailed methods
3. Details and data for equipment, including planned use and proximity to wall
4. Details for temporary shoring as necessary
5. Method for monitoring excavation
6. Detailed corrective actions
7. Schedule for all wall construction activities

Prepare the protection plan so that the excavation can be performed while protecting the archeological resource. Contractor is advised that methods and equipment that may cause excessive damage to the archeological resource, as determined by the Engineer, will not be allowed.

The protection plan must include details of corrective actions if damage occurs, as determined by the Engineer.

Schedule a meeting to discuss the protection plan. The meeting must include you, the Engineer, and the Archeological monitor. Allow 30 days for the Department's review of the plan. If the Engineer rejects the protection plan, make corrective changes and resubmit the protection plan.

Add to section 19-3.03B(1):

For ground-disturbing activities near the archeological monitoring area, located near retaining wall No. 290, the following requirements apply:

1. From station 10+00 to 11+60, excavate material by implementing the protection plan, using a vertical cut no greater than 10 ft in height. Grade at a 2:1 or flatter slope from the top of concrete gutter, as shown in the plans.
2. From station 11+60 to 13+02, excavate material by implementing the protection plan, using a vertical cut no greater than 10 ft in height. Stop production and take corrective action if damage has occurred, as determined by the Engineer. Obtain the Engineer's authorization before continuing the work

Add to section 19-3.03E(1):

For construction activities near the archeological monitoring area, located near retaining wall No. 290, the following requirements apply:

1. From station 10+00 to 11+60, structure backfill and pervious backfill shall be placed in accordance with Section 19-3.03E of the Standard Specifications, and as shown on the plans.
2. From station 11+60 to 13+02, there shall be no backfill material placed behind the retaining wall. In localized areas the wall can be thickened by up to 4 inches to account for uneven excavation. Structural concrete shall be cast directly against the native material. If the excavated face will not remain vertical and within 4 inches of the proposed back face of the wall, then other measures shall be taken to stabilize the wall face such as applying shotcrete and ground anchors, as necessary, prior to constructing the wall.

Low expansion material (material with an EI less than or equal to 50) shall be used for placement of backfill for fill at bridge approaches. All low expansion backfill shall be placed in thin, loose lifts; moisture-conditioned, as required, to near-optimum moisture content; and compacted to 95 percent relative compaction as determined by Caltrans Test Method 216.

Add to section 19-3.04:

Replace the 2nd sentence in the 7th paragraph of section 19-3.04 with:

Low expansion index backfill material will be measured and paid for by the cubic yard as structure backfill (bridge).

Replace section 19-4 with:

19-4 ROCK EXCAVATION (CONTROLLED BLASTING)

19-4.01 GENERAL

19-4.01A Summary

Section 19-4 includes specifications for performing rock excavation with controlled blasting and presplitting rock to form rock excavation slopes.

In general, the bedrock was determined to be rippable to a depth of 20 to 40 feet below ground surface. Bedrock excavability is expected to vary and may require blasting at localized areas. For additional information refer to section 2-1.06B for supplemental information and the Geotechnical Design Report.

You may use hydraulic splitters, pneumatic hammers, controlled blasting, or other roadway excavation techniques authorized to fracture rock and construct stable final rock cut faces.

Comply with section 12.

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." Regulations for explosives containing percholate materials include 22 CA Code of Regs, Division 4.5, Ch 33, "Best Management Practices for Percholate Materials."

You are liable for damages resulting from blasting activities.

19-4.01B Definitions

controlled blasting: Use of explosives and blasting accessories in predetermined spaced and aligned drill holes to limit blast vibrations, noise from airblast overpressure, and flyrock.

flyrock: Rock that becomes airborne due to blasting.

near field blasting: Blasting within 30 feet of a critical structure.

presplitting: Establishment of a free surface or shear plane in rock along the specified excavation slope by the controlled use of explosives and blasting accessories in appropriately aligned and spaced drill holes.

19-4.01C Submittals

19-4.01C(1) General

Submit 3 copies of the blasting safety plan and each controlled blasting plan. After each plan is authorized, submit 3 additional copies of each authorized plan.

19-4.01C(2) Blasting Safety Plan

Submit a blasting safety plan. 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 controlled blast design, loading, and conducting the blasting operation
 - 5.3. Safety officer for blasting subcontractor
 - 5.4. Blast monitoring consultant
 - 5.5. Blasting consultant
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 each MSDS and manufacturer data sheets of explosives, caps, primers, initiators, and other compounds

19-4.01C(3) Controlled Blasting Plan

Submit a controlled blasting plan for each blast. The plan must include details on how each blast will be controlled and the following:

1. Blast identification by numerical and chronological sequence
2. Location, referenced to stationing, offset distance, date, and time of blast
3. Drawings showing drill hole pattern, spacing, burden, and initiation sequence
4. Typical cross-sections through zone to be blasted
5. Groundwater level, if present, within the prism to be blasted
6. Initiation-sequence diagram showing the actual firing time of each delay
7. Type of material to be blasted
8. Number of drill holes
9. Diameter, depth, and spacing of holes
10. Height or length of stemming
11. Types and characteristics of explosives used, including explosive's density, relative strength, and date of manufacture
12. Type of caps and delay periods used and their date of manufacture
13. Total amount of explosives used
14. Total amount of explosives detonating within any 8 millisecond period
15. Powder factor (pounds of explosive per cubic yard of material blasted)
16. Method of firing
17. Direction and distance to nearest building or structure
18. Type and method of instrumentation
19. Location and placement of instruments
20. Measures to limit air noise and flyrock
21. Measures to limit overbreak
22. Name of blasting subcontractor
23. Name and signature of blaster-in-charge
24. Drawings showing spacing and proximity of shot guards to blast location

Changes to the controlled blasting plan made to adjust for site conditions must be submitted for review before implementing.

19-4.01D Quality Control and Assurance

19-4.01D(1) General

Not Used

19-4.01D(2) Blaster-In-Charge

Assign a blaster-in-charge responsible for supervising all blasting activities. The blaster-in-charge must have 10 years of experience in performing or supervising similar blasting activities and must be a licensed blaster.

19-4.01D(3) Blast Monitoring Consultant

Assign a blast monitoring consultant to monitor blasting generated vibrations and noise near buildings and structures that may be subject to damage. The monitoring consultant must be responsible for collecting and interpreting vibration and noise data. The blast monitoring consultant must:

1. Not be employed by the blasting contractor or other subcontractor on the project
2. Have a minimum of a 2-year Associate's Degree in science or engineering
3. Have at least 5 years of documented experience in collecting and interpreting ground vibrations and noise data

19-4.01D(4) Blasting Consultant

Assign a blasting consultant to oversee near field blasting activities. The blasting consultant must:

1. Be an engineer or geologist who is licensed in the State

2. Have 10 years of experience providing specialized blasting services in near field blasting
3. Not be employed by the blasting contractor, explosive manufacturer, or explosive distributor
4. Submit a resume of credentials and a list of projects worked on

19-4.01D(5) Preblast Surveys

At least 15 days before starting blasting activities, prepare a preblast survey of all buildings and structures within 330 feet of blasting activities and submit it with the controlled blasting plan. The preblast survey must include a written report, sketches, and photos or a videotape with date and time displayed on the image. The preblast survey must include:

1. Name of the person making the inspection
2. Name of property owner and occupants
3. Property address
4. Date and time of the inspection
5. Description of the structure or other improvement including culverts and bridges
6. Detailed description of existing condition of walls, ceiling, and floor of each interior room including attic and basement
7. Detailed description of existing condition of foundations, exterior walls, roofs, doors, windows, and porches
8. Detailed description of existing condition of garages, outbuildings, sidewalks, driveways, and swimming pools
9. Detailed listing of highway sign posts, light fixtures, and overhead power lines
10. Survey of wells or other private water supplies including total depth and existing water surface levels
11. Identification of sites conducting procedures, processes, or operations that may be sensitive to blasting activities
12. Scaled map or aerial photo showing the location of structures and properties surveyed and location of all proposed blasting sites

If blasting activities are suspended for a period of 45 days or more, perform another preblast survey and submit it at least 15 days before resuming blasting activities.

After blasting activities are completed, prepare and submit a postblast survey of the same buildings and structures as in the preblast survey. The postblast survey must include all items included in the preblast survey.

19-4.01D(6) Vibration and Noise Monitoring

Vibration levels must be kept below peak particle velocity of 2 inches per second at the nearest building or structure.

Noise from airblast overpressure levels must be kept below 128 dB (C-network or Linear network) at the nearest building

Ground vibrations and noise created from blasting must be controlled by using properly designed delay sequencing and charge weights for shots.

Provide 3 seismographs to be available for deployment that are appropriate for controlled blasting activities and capable of:

1. Recording particle velocities for 3 mutually perpendicular components of vibration and instantaneous resultant peak vector sum in the range generally found with controlled blasting.
2. Continuously measuring, recording, and reporting vibrations along 3 primary axes.
3. Measuring and recording vibration frequencies ranging from 2 to 300 Hz.
4. Providing a printed record of each event showing a plot of peak particle velocity versus vibration frequencies.
5. Measuring and recording airblast noise levels. The noise transducer must be detachable from the main unit to allow placing at elevations with a clear line of sight between transducer and blast.

Record each blast shot using approved seismographs and prepare a vibration and noise monitoring report. The report must include:

1. Identification of instruments used

2. Name of blast monitoring consultant
3. Distance and direction of recording stations from blast area
4. Type of ground at recording station and material on which instrument sits
5. Maximum particle velocity in each component and resultant peak particle velocity of each shot
6. Copy of seismograph readings with date and signature of blast monitoring consultant
7. Noise levels recorded in dB (C-network or Linear network) units

19-4.01D(7) Video Recording of Blasts

Video-record each blast. The video-recording must be taken from a safe location with a clear view of the blast area, activities, and progression. Identify each video or section of video with an index to identify each blast. Submit a copy of each video in DVD-Video format.

19-4.01D(8) Blasting Complaints

Accurately document each complaint. Notify the Engineer immediately of a complaint received or at the start of the next day's work shift. Complaint documentation must include:

1. Name and address of complainant
2. Date, time, and nature of complaint
3. Dated photo or videotape of physical damage
4. Name of person receiving complaint
5. Record of complaint investigation conducted
6. Resolution of complaint

19-4.01D(9) Postblast Reports

Document each shot in a postblast report. The postblast report must include all data required in the controlled blasting plan for that shot and the following:

1. Description of site conditions, loading, and time of blast
2. Description of weather conditions at time of blast including wind direction and cloud cover
3. Drillers boring record
4. Copy of vibration and noise monitoring report
5. Copy of documented complaints arising from the blast

Submit the postblast report within 48 hours of the blast.

19-4.02 MATERIALS

The maximum diameter of explosives used in presplit holes must not be greater than 50 percent of the diameter of the presplit hole.

Only standard cartridge explosives prepared and packaged by explosive manufacturing firms must be used in the presplit holes. These must consist of one of the following:

1. Fractional portions of standard cartridges to be affixed to the detonating cord in the field
2. Solid column explosives joined and affixed to the detonating cord in the field

Stemming materials must be dry, free-running material meeting the grading requirements in the following table when tested under California Test 202:

Sieve sizes	Percentage passing
3/8"	100
No. 8	90

19-4.03 CONSTRUCTION

At least 7 days before starting or resuming blasting activities, notify occupants of the local buildings within 330 feet of the blasting area in writing. Verbally notify occupants of pending blasting activities on the day of blasting.

Do not perform blasts within 1,200 feet of concrete placed within 72 hours.

Before firing any blast, confirm that groundwater conditions are consistent with shot design and explosive type to be used.

Before firing any blast in areas where flyrock may result in personal injury or damage to property or the work, cover the rock to be blasted with blasting mats, soil, or other equally serviceable material to prevent flyrock.

If blasting causes flyrock, suspend blasting activities. The blasting consultant must review the site to determine the cause of the flyrock problem and provide an amendment to the controlled blasting plan that prevents flyrock.

Do not use drill cuttings as stemming in controlled blasting operations.

Before drilling the presplitting holes, remove overburden soil and weathered rock along the top of the excavation for a distance of at least 50 feet beyond the drilling limits or to the end of the excavation. Ensure removal of overburden soil and weathered rock and expose fresh rock to an elevation equal to the bottom of the adjacent lift of the presplitting holes being drilled.

Drill slope holes for presplitting along the line of the planned slope within the tolerances specified. The drill holes must be at least 2-1/2 inches, but not more than 3 inches in diameter. Control the drilling operations by using proper equipment and techniques. Ensure no hole deviates from the plane of the planned slope by more than 12 inches or from parallel to an adjacent hole by more than 67 percent of the planned horizontal spacing between holes.

The length of presplit holes for an individual lift must not exceed 30 feet, unless you can demonstrate to the Engineer that you can stay within the above tolerances and produce a uniform slope. The length of holes may then be increased to a maximum of 60 feet if authorized.

The spacing of presplit holes must not exceed 3 feet on centers and must be adjusted to produce a uniform shear face between holes.

The Engineer may order you to drill auxiliary holes along the presplit line. These holes must not be loaded or stemmed. Except for spacing, auxiliary drill holes must comply with the specifications for presplit holes. Drilling auxiliary drill holes along the presplit line is extra work.

Place the adjacent line of production holes inside the presplit lines in such a manner that avoids damage to the presplit face.

If necessary to reduce shatter and overbreak of the presplit surface, the 1st line of production holes must be drilled parallel to the slope line at the top of the cut and at each bench level thereafter.

Blasting techniques that result in damage to the presplit surface must be discontinued immediately.

No portion of the production holes must be drilled within 8 feet of a presplit plane unless authorized. The bottom of the production holes must not be lower than the bottom of the presplit holes.

A maximum offset of 24 inches will be permitted for a construction working bench at the bottom of each lift for use in drilling the next lower presplitting pattern.

Adjust the drilling operations to compensate for drift of previous levels and for the offset at the start of new levels to maintain the specified slope plane.

If the methods of drilling and blasting do not produce the desired result of a uniform slope and shear face without overbreak and within the tolerances specified, drill, blast, and excavate in short sections, up to 100 feet, until a technique produces desired results.

If a fractional portion of a standard explosive cartridge is used, the cartridge must be firmly affixed to a length of detonating cord equal to the depth of the drill hole so that the cartridge does not slip down the detonating cord nor cock across the hole and bridge the flow of stemming material. Spacing of cartridges along the length of the detonating cord must not exceed 30 inches center to center and must be adjusted to give the desired results.

If a solid column type explosive is used, the column must be assembled and affixed to the detonating cord to comply with the explosive manufacturer's instructions. Submit as an informational submittal a copy of the explosive manufacturer's instruction before using the column type explosive.

The bottom charge of a presplit hole may be larger than the line charges but must not cause overbreak. The top charge of the presplitting hole must be placed far enough below the collar to avoid overbreaking the surface.

Before placing the charge, the hole must be free of obstructions for the hole's entire depth. Ensure placing of the charge does not cause caving of material from the walls of the holes.

The Engineer may order the use of stemming materials as necessary to achieve a satisfactory presplit face. Stemmed presplit holes must be completely filled to the collar.

Detonate charges in each presplitting pattern simultaneously.

The tolerances in section 19-2.03G do not apply to presplit surfaces of excavation slopes where presplitting is required. The presplit face must not deviate more than 1 foot from the plane passing through adjacent drill holes, except where the character of the rock is such that irregularities are unavoidable. The average plane of the completed slopes must not deviate more than 1 foot from the plan slopes. These tolerances are measured perpendicular to the plane of the slope. No portion of the slope may encroach on the roadbed.

If equally satisfactory presplit slopes are obtained, you may either presplit the slope face before drilling for production blasting or presplit the slope face and production blast at the same time, provided that the presplitting drill holes are fired with zero delay. The production holes must be delayed by at least 50 milliseconds starting at the row of holes farthest from the slope and progressing in steps to the row of holes nearest the presplit line. The presplitting holes must extend either to the end of the excavation or for a distance of not less than 50 feet beyond the limits of the production holes to be detonated.

19-4.04 PAYMENT

Rock excavation is measured as specified for roadway excavation in section 19-2.04.

The Department does not pay for holes that:

1. Fail to meet the alignment specified controls
2. Are drilled where the finish slope does not meet the slope tolerances specified

The Department pays only for holes that qualify as to alignment and slope finish and show a hole trace for approximately 50 percent of the drilled length.

The Engineer determines which presplit holes qualify for payment after excavation but before slope trimming or cleanup work.

Drill hole (presplitting) is measured by the theoretical slope length computed from elevations taken before detonating each lift and a plane 3 feet below finished grade. The Department does not pay for drilling more than 3 feet below finished grade unless additional drilling is ordered. For holes that produce an acceptable slope and comply with the tolerances, except alignment within the plane of the slope, the length paid for is 75 percent of the theoretical slope length.

Add as section 19-6.03C(1) Oversized Material:

19-6.03C(2) Summary

Section 19-6.03(C1) includes specifications for constructing embankments with oversized material generated from roadway excavation.

19-6.03C(3) Definitions

Oversized Material: Oversized material is defined as rock or other irreducible materials with a maximum dimension greater than 12 inches.

19-6.03C(4) Placing and Compacting

Any oversized material shall not be used in the embankment fill unless the Engineer approves of the location of materials and disposal methods. Oversized material should be taken offsite or placed in accordance with the Engineer to areas designated as suitable for oversized material. Oversized material shall not be placed within 10 feet vertically of finished grade or within 20 feet horizontally of slope faces. Oversized material shall not be placed within range of foundation excavations, future utilities or underground construction as determined by the Engineer.

Add to section 19-6.04:

Full compensation for conformance with the Oversized material requirements, including labor, equipment, materials, necessary traffic control, and incidentals, shall be considered as included in the contract unit price for roadway excavation, and no additional compensation will be allowed therefor.

Add to section 19-6.03D:

At the Wildlife Overcrossing bridge foundations, contractor shall check settlements and horizontal displacement of the foundation to ensure that they are within allowable limit. Refer to Wildlife Overcrossing bridge plans for specifications and requirements for settlement monitoring.

Replace section 19-10 with the following:

19-10 SUBGRADE ENHANCEMENT GEOGRID

19-10.01 GENERAL

Section 19-10 includes specifications for placing subgrade enhancement geogrid between the subgrade and pavement structure.

19-10.02 MATERIALS

19-10.02A General

The geogrid shall be multi-axial Type R3 in conformance to the physical properties listed Table 1 below. Multi-axial geogrids shall be manufactured using polypropylene material. The geogrid reinforcement elements shall consist of regular network of integrally connected polymer tensile elements with aperture geometry capable of providing mechanical interlock with the surrounding soil, aggregate or other material.

Geogrids shall conform to the tables shown below. Unless otherwise shown, all values represent minimum average roll values (MARV) as defined in ASTM D4439.

TABLE 1: MULTI-AXIAL				
Property	Test Reference	Type¹		
		R1	R2	R3
Aperture Shape	Observation	Triangular	Triangular	Triangular
Radial Stiffness @ 0.5% Strain lbs/ft (kN/m), Min.	ASTM D6637 ²	10,285 (150)	15,430 (225)	20,580 (300)
Radial stiffness Ratio, dimensionless	ASTM D6637 ³	>0.60	>0.60	>0.60

Junction Strength Efficiency (%)	ASTM D7737 ⁴	93	93	93
Ultraviolet Stability, @ 500 hrs (%)	ASTM D4355-05	70	70	70

1. Multi-axial geogrid contains six or more intersecting ribs at each junction formed into a radially stable network of open equilateral triangular apertures. Multi-axial geogrid is used for subgrade stabilization, aggregate base reduction, asphalt concrete reduction, and/or life extension in pavement or railroad applications.
2. Minimum measured radial stiffness at 0.5% strain. Radial stiffness is measured on both the rib directions and the mid-rib directions (directions that bisect the angles between ribs).
3. Ratio of the minimum to maximum MARV values of radial stiffness at 0.5% strain
4. Load transfer capability determined in accordance with ASTM D7737 and ASTM D6637 and expressed as a percentage.

19-10.02B Storage and Handling

Prevent excessive mud, wet concrete, epoxy, or other deleterious materials from coming in contact with and affixing to the geogrid materials.

Store at temperatures above minus 20 degrees F (minus 29 degrees C).

Rolled materials may be laid flat or stood on end.

Geogrid materials should not be left directly exposed to sunlight for a period longer than the period recommended by the manufacturer

19-10.03 SUBMITTALS

Submit geogrid product sample approximately 1 foot x 1 foot.

Submit the manufacturer's certificate of compliance and certified test results on the product, tested within six months of the submittal date. Sampling shall be in accordance with ASTM D4354. Additionally, the following shall be included in the submittal:

1. Manufacturer's name, current address, and telephone number.
2. Manufacturer's current Quality Assurance / Quality Control Manual.
3. Full product name by trademark and product number.
4. Geogrid polymer type(s).
5. Installation instructions.
6. Geogrid product data sheet.

19-10.04 CONSTRUCTION

19-10.04A Placement

Before placing subgrade enhancement geogrid, remove loose or extraneous material and sharp objects that may come in contact with the geogrid material.

Place subgrade enhancement geogrid:

1. Under manufacturer's instructions
2. Longitudinally along the roadway alignment
3. Without wrinkles
4. The subgrade soil shall be prepared as indicated on the construction drawings or as directed by the Engineer.
5. The geogrid shall be placed at the proper elevation and alignment as shown on the construction drawings.

6. The geogrid shall be installed longitudinally along the roadway alignment in accordance with these plans, specifications and any installation guidelines provided by the manufacturer, or as directed by the Engineer,
7. The geogrid may be temporarily secured in place with plastic zip ties, aggregate base or fill backfill as required by fill properties.
8. Adjacent rolls of geogrid shall be overlapped a minimum of 1 foot. Softer subgrade conditions may require up to 3 feet of overlap.
9. Granular fill material shall be placed, spread, and compacted in such a manner that minimizes the development of wrinkles in the geogrid and/or movement of the geogrid.
10. A minimum loose fill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid. When underlying substrate is trafficable with minimal rutting, rubber-tired equipment may pass over the geogrid reinforcement at slow speeds (less than 10 mph). Sudden braking and sharp turning movements shall be avoided.
11. Any damaged or defective geogrid (i.e. frayed coating, separated junctions, separated layers, tears, etc.) will be repaired/replaced. Any roll of geogrid damaged before, during and after installation shall be replaced by the Contractor at no additional cost to the Department. Proper replacement shall consist of replacing the affected area.
12. Post-construction trenching through the geogrid shall be accomplished with conventional trenching equipment. Repairs to the trenched section shall be accomplished using a full structural replacement of the displaced materials (e.g. compacted structural fill, flowable fill, etc) or with a repaired section that is identical to the original section. If the section is repaired to match the original, the trench backfill must be compacted to the same or higher density and the geogrid must be overlapped a minimum of 3-inches at the proper geogrid elevation.

You may fold or cut subgrade enhancement geogrid to conform to curves. If cut, overlap at least 2 feet. Hold the overlap in place with staples, pins, or small piles of material placed on the geogrid.

Do not:

1. Stockpile material on the geogrid
2. Place more geogrid than can be covered in 72 hours

Repair or replace damaged subgrade enhancement geogrid. Make repairs by placing a new piece of geogrid with at least 3 feet of overlap from the edges of the damaged area.

19-10.04B Quality Control

Pre-Construction Conference: Prior to the installation of the geogrid, the Contractor shall arrange a meeting at the site with the manufacturer representative and, where applicable, the geogrid installer. The engineer shall be notified at least 3 days in advance of the time of the meeting.

A manufacturer representative shall be present, at minimum, for the first day of installation of the geogrid and available thereafter upon request by the engineer.

19-10.04 PAYMENT

The Department does not pay for additional geogrid used for overlaps.

Geogrid shall be measured by the square yard of geogrid placed.

Payment for the geogrid will be made at the Contract Unit price for square yard.

Nassellia cernua, Nodding Stipa	30	4.0
Nassellia pulchra, Purple Needle Grass	30	3.0
Plantago erecta, California Plantain	N/A	5.0
Penstemon speciabilis, Showy Penstemon	N/A	3.0
Salvia apiana, White Sage*	N/A	3.0
Salvia columbariae, Chia	N/A	2.0
Trichostema lanatum, Woolly Blue Curls*	N/A	2.0
Total		61.0

Seed mix for the Riparian area impacted directly at Warm Springs Creek, as shown on the plans, must comply with the following:

Seed Mix (Warm Springs Creek, Riparian Area)

Botanical Name (Common Name)	Percent Germination (Minimum)	Pounds Pure Live Seed Per Acre (Slope Measurement)
Baccharis salicifolia, mulefat	N/A	0.1
Baccharis salicina, Emory's baccharis	N/A	0.2
Anemopsis californica, Yerba mansa	N/A	0.5
Juncus mexicanus, Mexican rush	N/A	0.1
Eleocharis palustris, Spike rush	N/A	2.8
Heliotropium curassavicum, alkali heliotrope	N/A	1.7
Total		5.4

Seed mix for the Riparian area on Clinton Keith Rd, at approximate Station 270+00, as shown on the plans, must comply with the following:

Seed Mix (Clinton Keith Rd, Riparian Area)

Botanical Name (Common Name)	Percent Germination (Minimum)	Pounds Pure Live Seed Per Acre (Slope Measurement)
Baccharis salicifolia, mulefat	N/A	0.3
Sambucus nigra, Blue elderberry	N/A	102.5

Total	102.8
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Replace section 21-1.02K with the following:

21-1.02K EROSION CONTROL (BONDED FIBER MATRIX (BFM) WITH SEEDS):

21-1.02K(1) General

This work includes applying erosion control materials to roadway slopes and flat areas impacted by construction activities.

The limit of work for erosion control (Bonded Fiber Matrix with Seeds) is from Station 238+00 to 326+00 as shown on the plans.

Erosion Control (Bonded Fiber Matrix (BFM) with Seeds) shall be used on roadway slopes and flat areas (e.g. graded but unpaved half width roadway) Specific direction shall be given by the Engineer.

Erosion control (BFM) must comply with Section 21, "Erosion Control," of the Standard Specifications.

Before applying erosion control materials, prepare soil surface under Section 19-2.03G, "Slopes," of the Standard Specifications except that rills and gullies exceeding 2 inches in depth or width must be leveled. Remove invasive vegetative growth (weeds), 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 acre 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.

Before applying erosion control materials, provide the County no less than three (3) results from no less than three (3) random soils tests from the area to receive erosion control materials. The results shall be come from a reputable, resourceful, and professional soils and plant laboratory. Scientific test results shall include soil Ph, total dissolved salts, sodium absorption ratio, organic matter, soil texture, infiltration rate, nutrients N-P-K, all minor elements, and trace elements.

Before applying erosion control materials, provide the County with a submittal outlining type of seed with species and common name, pure live seeds per acre, bonded fiber matrix product and application rate, premium compost product and application rate, organic fertilizer product and application rate, mycorrhizal fungi soil amendment product and application rate. Provide information on selected vendor and products as requested.

21-1.02K(2) MATERIALS

Materials must comply with Section 21-1.02, "Materials," of the Standard Specifications and these special provisions.

The following list of erosion control materials shall be used at the noted rates:

- Pure Live Seed Mix as outlined below 32.5 lbs/acre
- Bonded Fiber Matrix Product 3,500 lbs./acre (up to 1H:1V)
- Premium Compost Product 1,000 lbs./acre
- Commercial Fertilizer 800 lbs./acre
- Mycorrhizal Fungi Soil Amendment 60 lbs./acre
- Humate Soil Amendment 1 lb./acre

21-1.02K(3) Seed

Seed must comply with Section 21-1.02G, "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 1 ounce or 0.25 cup of seed for each seed lot greater than 2 pounds.

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Seed must comply with the following:

Species	Common Name	Pure Live Seed Lbs/Acre
<i>Adenostoma fasciculatum</i>	Chamise	1.00
<i>Artemesia California</i>	Calif. Sagebrush	0.20
<i>Baccharis sarothroides</i>	Desertbroom Baccharis	0.10
<i>Encelia farinosa</i>	Brittlebush	1.00
<i>Eremocarpus setigerus</i>	Dove Weed	2.00
<i>Eriogonum fasciculatum</i>	Calif. Buckwheat	1.00
<i>Eschscholzia californica</i>	Calif. Poppy	1.50
<i>Gutierrezia californica</i>	San Joaquin snakeweed	0.10
<i>Lasthenia californica</i>	California goldfields	0.50
<i>Lessingia filaginifolia</i>	Common Sandaster	0.10
<i>Lotus scoparius</i>	Deerweed	4.00
<i>Lupinus bicolor</i>	Dove Lupine	2.00
<i>Opuntia littoralis</i>	Coast Prickly-pear	1.00
<i>Poa secunda</i>	Pinemat bluegrass	5.00
<i>Sambucus Mexicana</i>	Mexican Elderberry	1.00
<i>Salvia columbariae</i>	Chia	1.00
<i>Salvia mallifera</i>	Black sage	3.00
<i>Vulpia microstachys</i>	Small fescue	8.00
		Total 32.5
Seed Mix provided by S&S Seeds or approved equivalent.		

*NOTE: PLS LBS/ACRE ≠ Lbs/acre. PLS LBS/ACRE is the most accurate way to specify seeds and takes into account both purity and germination. PLS% = % Purity X % Germination.

21-1.02K(4) Seed Sampling Supplies

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

21-1.02K(5) Bonded Fiber Matrix (BFM) Product

Fiber must comply with Section 21-1.02E, "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 3/8 inch long, with a minimum of 50 percent retained on a No. 25 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.

The Bonded Fiber Matrix (BFM) shall be a hydraulically applied flexible erosion control blanket composed of long strand, thermally processed wood fibers and a proprietary crosslinked, hydro-colloid tackifier. The BFM may require a 24-48 hour curing period to achieve maximum performance. Once cured, the BFM forms an intimate bond with the soil surface to create a continuous, absorbent, flexible and biodegradable erosion resistant blanket that allows for rapid germination and accelerated plant growth. (**Product described is Profile Hydro-Blanket or County-approved equal.)

**Specific brands or products referenced in the Special Provisions are guidelines only, and products from alternate manufacturers will be accepted, provided that the product and its performance are a close approximation of the specified product.

Bonded Fiber Matrix (BFM) shall have a specification as noted below when applied at a rate of 3,000-4,000 lbs./acre:

PHYSICAL	TEST METHOD	
Mass Per Unit Area	ASTM D-6566	11.5 oz/yd ²
Thickness	ASTM D-6525	.12 in
% Ground Cover	STM D-6567	99%
Water Holding Capacity	Profile Product ²	1350%
Cure Time	Observed	24-48/hr
Color (fugitive dye)	Observed	Green
ENDURANCE		
Functional Longevity	Observed	Up to 8 months
PERFORMANCE		
Cover Factor (6 in/hr event)	ECTC Test Method #2	0.10
% Effectiveness	ECTC Test Method #2	90%
Vegetation Establishment	ECTC Test Method #2	600%

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 21-2.02F 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.

21-1.02K(6) Premium Compost Product

Premium Compost shall be compatible with BFM and sustain long term vegetative cover and help establish native vegetation and seeds. The Premium Compost shall be well suited for revegetating and hydroseeding applications. The Premium Compost shall improve soil structure, improve air and water permeability, reduce bulk density, increase water capacity, and improve soil aggregation. Application rate shall be 1,000 lbs./acre as noted below (**Product described is Hydropost Premium Compost Mulch or County-approved equal.)

**Specific brands or products referenced in the Special Provisions, are guidelines only, and products from alternate manufacturers will be accepted, provided that the product and its performance are a close approximation of the specified product.

21-1.02K(7) Commercial Fertilizer Product

Commercial Fertilizer shall be organic based with a Nutrient ratio of N-P-K = 7-2-1 and consisting of greater than 90% fungal and bacterial biomass. The fertilizer shall be time/slow release Nitrogen well suited for revegetating and soil support and thus reducing nitrate pollution. The fertilizer shall be able to be mixed into hydroseeding tanks without adverse reactions. Application rate shall be 800 lbs./acre as noted below. (**Product described is Biosol Forte 7-2-1 Time Release Fertilizer or County-approved equal.)

**Specific brands or products referenced in the Special Provisions, are guidelines only, and products from alternate manufacturers will be accepted, provided that the product and its performance are a close approximation of the specified product.

21-1.02K(8) Mycorrhizal Fungi Soil Amendment

Mycorrhizal fungi soil amendment product shall be a dry powder, soil binding agent, increasing soil aggregation and aeration leading to increased root growth in plants. Product shall be readily available for hydroseeding applications. Application rate shall be 60 lbs./acre as noted below. (** Product described is AM 120 Mycorrhizal inoculums or County-approved equal.)

**Specific brands or products referenced in the Special Provisions, are guidelines only, and products from alternate manufacturers will be accepted, provided that the product and its performance are a close approximation of the specified product.

21-1.02K(9) Humate Soil Amendment

Humate soil amendment product shall be Humic Acid based granular soil conditioner and help improve soil structure formation, assists in aeration, source of plant nutrients, increase germination capacity of seed, increased health and vigor. Application rate shall be 1 lb./acre. (**Product described is Tri-C Humate or County-approved equal.)

**Specific brands or products referenced in the Special Provisions, are guidelines only, and products from alternate manufacturers will be accepted, provided that the product and its performance are a close approximation of the specified product.

Replace section 21-1.02N with the following:

21-1.02N EROSION CONTROL (TYPE D):

21-1.02N(1) General

Erosion control (Type D) includes applying erosion control materials to embankment of the Extended Detention Basins (EDBs). Erosion control (Type D) must comply with Section 21, "Erosion Control" of the Standard Specifications and these Special Provisions.

Erosion Control (Type D) shall be used for the Extended Detention Basins (EDBs) with slopes no steeper than 3H:1V that do not require the Bonded Fiber Matrix erosion control. Specific direction shall be given by the Engineer.

Before applying erosion control materials, prepare soil surface under Section 19-2.03G, "Slopes," of the Standard Specifications except that rills and gullies exceeding 2 inches in depth or width must be leveled.

Remove invasive vegetative growth (weeds), temporary erosion control materials, and other debris from areas to receive erosion control.

Before applying erosion control materials, the Engineer designates the ground location of erosion control (Type D) in increments of one acre or smaller for smaller areas. Place stakes or other suitable markers at the locations designated by the Engineer. Furnish all tools, labor and materials required to adequately indicate the various locations.

Before applying erosion control materials, provide the County no less than three (3) results from no less than three (3) random soils tests from the area to receive erosion control materials. The results shall be come from a reputable, resourceful, and professional soils and plant laboratory. Scientific test results shall include soil Ph, total dissolved salts, sodium absorption ratio, organic matter, soil texture, infiltration rate, nutrients N-P-K, all minor elements, and trace elements.

Before applying erosion control materials, provide the County with a submittal outlining type of seed with species and common name, pure live seeds per acre, premium compost product and application rate, organic fertilizer product and application rate, mycorrhizal fungi soil amendment product and application rate. Provide information on selected vendor and products as requested.

21-1.02N(2) MATERIALS

Materials must comply with Section 21-1.02, "Materials," of the Standard Specifications and these special provisions.

The following list of erosion control materials shall be used at the noted rates:

- Seed Mix as outlined below 34.7 lbs./acre
- Wood Fiber Hydraulic Mulch 1,500-2,500 lbs./acre
- Premium Compost Product 1,000 lbs./acre
- Stabilizing Emulsion - Binder/Tackifier 150 lbs./acre
- Commercial Fertilizer 800 lbs./acre
- Mycorrhizal Fungi Soil Amendment 60 lbs./acre
- Humate Soil Amendment 1 lb./acre

21-1.02N(3) Seed

Seed must comply with Section 21-1.02G, "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 1 ounce or 0.25 cup of seed for each seed lot greater than 2 pounds.

Seed must comply with the following:

Species	Common Name	Pure Live Seed Lbs/Acre
Achillea millefolium	Common Yarrow	0.50

Agrostis pallens	Seashore Bent Grass	5.00
Artemesia douglasiana		0.20
Deschampsia danthoniodes	California Mugwort	3.00
Hordeum brachyantherum		10.00
Leymus triticoides	Beardless Wild Rye	6.00
Trifolium obtusiflorum	Clammy Clover	2.00
Vulpia microstachys	Small fescue	8.00
		Total 34.7
Seed Mix provided by S&S Seeds or approved equivalent.		

*NOTE: PLS LBS/ACRE ≠ Lbs/acre. PLS LBS/ACRE is the most accurate way to specify seeds and takes into account both purity and germination. PLS% = % Purity X % Germination.

21-1.02N(4) Seed Sampling Supplies

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

21-1.02N(5) Wood Fiber Mulch

Wood Fiber Mulch product shall be fully biodegradable hydraulic mulch composed of 100% recycled wood fibers, free of any and all plastic. Application rate shall be 1,500-2,500 lbs./acre. (**Product described is Conweld Fibers Hydro Mulch 100 with Trifo by Profile products or County-approved equal.)

**Specific brands or products referenced in the Special Provisions are guidelines only, and products from alternate manufacturers will be accepted, provided that the product and its performance are a close approximation of the specified product.

PHYSICAL	TEST METHOD	
Water Holding Capacity	ASTM D7367	1100%
Cure Time	Observed	24-48/hr
Color (fugitive dye)	Observed	Green
ENDURANCE		
Functional Longevity	Observed	Up to 3 months
PERFORMANCE		
Cover Factor	Large Scale	0.55 maximum
% Effectiveness	ECTC Test Method #2	45% minimum
Vegetation Establishment	ECTC Test Method #2	600%

21-1.02N(6) Premium Compost Product

Premium Compost shall be compatible with BFM and sustain long term vegetative cover and help establish native vegetation and seeds. The Premium Compost shall be well suited for revegetating and hydroseeding applications. The Premium Compost shall improve soil structure, improve air and water permeability, reduce bulk density, increase water capacity, and improve soil aggregation. Application rate shall be 1,000 lbs./acre. (**Product described is Hydropost Compost Mulch or County-approved equal.)

**Specific brands or products referenced in the Special Provisions are guidelines only, and products from alternate manufacturers will be accepted, provided that the product and its performance are a close approximation of the specified product.

21-1.02N(7) Stabilizing Emulsion

Stabilizing emulsion shall be a concentrated liquid chemical that forms a plastic film upon drying and allows water and air to penetrate.

Stabilizing emulsion shall be nontoxic to plant or animal life and nonstaining to concrete or painted surfaces. In the cured state, the stabilizing emulsion shall not be re-emulsifiable. The material shall be registered with and licensed by the State of California, Department of Food and Agriculture, as an "auxiliary soil chemical."

Stabilizing emulsion shall be miscible with water at the time of mixing and application.

A Certificate of Compliance for stabilizing emulsion shall be furnished to the Engineer in conformance with the provisions in Section 6-3.05E, "Certificates of Compliance."

21-1.02N(8) Stabilizing Emulsion – Binder/Tackifier

Stabilizing emulsion must comply with Section 21-1.02N(7), "Stabilizing Emulsion" of the Standard Specifications and these Special Provisions.

Stabilizing emulsion:

1. Must be in a dry powder form.
2. Must be a processed organic adhesive used as a soil tackifier.
3. May be reemulsifiable.
4. Application rate shall be 150 lbs./acre.

(**Product is Ecology Control M-Binder Tackifier or County-approved equal.)

**Specific brands or products referenced in the Special Provisions are guidelines only, and products from alternate manufacturers will be accepted, provided that the product and its performance are a close approximation of the specified product.

21-1.02N(9) Commercial Fertilizer Product

Commercial Fertilizer shall be organic based with a Nutrient ratio of N-P-K = 7-2-1 and consisting of greater than 90% fungal and bacterial biomass. The fertilizer shall be time/slow release Nitrogen well suited for revegetating and soil support and thus reducing nitrate pollution. The fertilizer shall be able to be mixed into hydroseeding tanks without adverse reactions. Application rate shall be 800 lbs./acre. (**Product is Biosol 7-2-1 Time Release Fertilizer or County-approved equal.)

**Specific brands or products referenced in the Special Provisions are guidelines only, and products from alternate manufacturers will be accepted, provided that the product and its performance are a close approximation of the specified product.

21-1.02N(10) Mycorrhizal Fungi Soil Amendment

Mycorrhizal fungi soil amendment product shall be a dry powder, soil binding agent, increasing soil aggregation and aeration leading to increased root growth in plants. Product shall be readily available for hydroseeding applications. Application rate shall be 60 lbs./acre. (**Product described is AM 120 Mycorrhizal inoculums or County-approved equal.)

**Specific brands or products referenced in the Special Provisions are guidelines only, and products from alternate manufacturers will be accepted, provided that the product and its performance are a close approximation of the specified product.

21-1.02N(11) Humate Soil Amendment

Humate soil amendment product shall be Humic Acid based granular soil conditioner and help improve soil structure formation, assists in aeration, source of plant nutrients, increase germination capacity of seed, increased health and vigor. Application rate shall be 1 lb./acre. (**Product described is Tri-C Humate or County-approved equal.)

**Specific brands or products referenced in the Special Provisions are guidelines only, and products from alternate manufacturers will be accepted, provided that the product and its performance are a close approximation of the specified product.

Replace "biodegradable jute, sisal, or coir fiber" in the 1st paragraph of the RSS for section 21-1.02P with:

Add to section 21-1.02P:

Straw must be weed free. Weed-free straw must comply with the Department of Food and Agriculture's certification requirements for weed-free straw.

Replace the 3rd paragraph of section 21-1.03D:

Areas impacted will be re-graded to original contours, and topsoil redistributed across impact area. A hydroseed mix shall be applied to the topsoil placed at the riparian areas as shown on plans. Water may be used to assist the process but must not cause erosion.

Add to the 1st paragraph of section 21-1.03E:

Seed mix for Hydroseed (Wildlife Overcrossing) must comply with section 21-1.02G of these special provisions.

Replace section 21-1.03J with:

21-1.03J Erosion Control (Bonded Fiber Matrix (BFM) With Seeds)

21-1.03J(1) APPLICATION AND INSTALLATION

Erosion Control (Bonded Fiber Matrix) for the side slope areas as shown in the plans must be applied during the period of October 1st to November 30th.

Erosion Control (Bonded Fiber Matrix) for the detention basin areas as shown in the plans must be applied during the period of May 1st to June 30th.

Application and Installation must comply with Section 21-1.03E, "Hyrdomulch and HydroSeed" of the Standard Specifications and these special provisions.

Add a coloring agent to the emulsion to contrast with the area on which it is applied. Add a different coloring agent to the emulsion to contrast with the area on which was already spray in Step 1 noted below. 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 and per approved product manufacturer's installation instructions. The proportions of various erosion control materials may be changed by the Engineer to meet field conditions. Once work is started in an area, complete stabilizing emulsion applications in that area on the same working day.

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 24-36-48 hours of dry weather between completion of material application and predicted precipitation.

Step 1 – In tank, mix seed, compost, fertilizer, mycorrhizal fungi, and humate in tank with a small amount of BFM (5-15% for visual metering). Apply to areas designated to receive BFM. Begin application within 60 minutes of adding seed to the mixture.

Step 2 – Generally within an hour of applying the material in Step 1, mix BFM per manufacturer's directions in regard to fiber and water and application processes. Use a different color of coloring agent. Apply material over areas sprayed in Step 1.

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

21-1.03J(2) MAINTENANCE

Maintenance operations shall begin immediately after hydroseeding and shall continue satisfactorily for the duration of the project; or for a period of 90 days or more if directed by the Engineer after the project is complete at no additional cost to the County.

During the 90 days maintenance or more, if directed by the Engineer, the Contractor shall maintain the area free of non-desired weeds and at no additional cost to the County.

A written notice requesting start of 90 days of Maintenance or a final inspection shall be received by the Engineer 5 days in advance.

Reapply erosion control products in the same fashion as noted above in the section "Application and Installation".

Reapply erosion control when the area treated exhibits visible erosion. Reapply erosion control within 24-48 hours of identifying visible erosion, unless otherwise approved by the Engineer.

Repair erosion control damaged during the progress of work resulting from your vehicles, equipment, or operation. Repairs shall be made as soon as possible or by the direction of the Engineer.

Reapply erosion control to areas noted by the Engineer as directed or as needed or required prior to demobilization.

Monitoring for pollutants not visually detectable in storm water is required by the General Construction NPDES Permit including soil amendments and soil stabilization products.

Replace section 21-1.03M with:

21-1.03M Erosion Control (Type D)

21-1.03M(1) Application and Installation

Application and Installation must comply with Section 21-1.03E, "Hydromulch and Hydroseed" of the Standard Specifications and these special provisions.

Add a coloring agent to the emulsion 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.

Install the material per approved product manufacturer's installation instructions. The proportions of various erosion control materials may be changed by the Engineer to meet field conditions.

Use hydroseeding equipment to apply erosion control to all disturbed soil surfaces. Apply erosion control from two (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.

Step 1 – In tank, mix seed, wood fiber mulch, binder/tackifier compost, fertilizer, mycorrhizal fungi, and humate in tank. Apply to areas designated to receive Type D. Begin application within 60 minutes of adding seed to the mixture.

Once work is started in an area, complete stabilizing emulsion applications in that area on the same working day. The Engineer may change the rates of erosion control materials 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.

21-1.03M(2) MAINTENANCE

Maintenance operations shall begin immediately after hydroseeding and shall continue satisfactorily for the duration of the project; or for a period of 90 days or more if directed by the Engineer after the project is complete at no additional cost to the County.

During the 90 days maintenance or more, if directed by the Engineer, the Contractor shall maintain the area free of non-desired weeds and at no additional cost to the County.

A written notice requesting start of 90 days of Maintenance or a final inspection shall be received by the Engineer 5 days in advance.

Reapply erosion control products in the same fashion as noted above in the section “Application and Installation”.

Reapply erosion control when the area treated exhibits visible erosion. Reapply erosion control within 24-48 hours of identifying visible erosion, unless otherwise approved by the Engineer.

Repair erosion control damaged during the progress of work resulting from your vehicles, equipment, or operation. Repairs shall be made as soon as possible or by the direction of the Engineer.

Reapply erosion control to areas noted by the Engineer as directed or as needed or required prior to demobilization.

Monitoring for pollutants not visually detectable in storm water is required by the General Construction NPDES Permit, including soil amendments and soil stabilization products.

Add to section 21-1.04:

The unit price paid per square foot for Erosion Control (Type D), shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the specified work in the Standard Specifications and these Special Provisions and no additional compensation will be allowed therefor.

The unit price paid per square foot for Erosion Control (Bonded Fiber Matrix with Seeds), shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying erosion control (BFM with Seeds, amendments), complete in place, as shown on the plans, as specified in the Standard Specifications and these Special Provisions and no additional compensation will be allowed therefor.

The unit price paid per square foot for Hydroseed (Wildlife Overcrossing), shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying Hydroseed (Wildlife Overcrossing), complete in place, as shown on the plans, as specified in the Standard Specifications and these Special Provisions and no additional compensation will be allowed therefor.

The unit price paid per square foot for Hydroseed (Riparian Area), shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying Hydroseed (Riparian Area), complete in place, as shown on the plans, as specified in the Standard Specifications and these Special Provisions and no additional compensation will be allowed therefor.

Selected material topsoil is paid for as roadway excavation as specified in section 19-2.

The Contractor shall ensure the safe transportation, storage, use, and disposal of asphalt.

The Contractor shall prevent the formation of carbonized particles caused by overheating asphalt during manufacturing or construction.

The grade for asphalt binder shall be PG 64-10 for HMA Type A and PG 70-10 for HMA Type C.

Grades

Performance graded (PG) asphalt binder [and PG polymer modified asphalt binder] shall conform to the following table[s]:

Performance Graded Asphalt Binder

Property	AASHTO Test Method	Specification Grade		
		PG 64-10	PG 64-16	PG 70-10
Original Binder				
Flash Point, Minimum °C	T48	230	230	230
Solubility, Minimum % ^b	T44	99	99	99
Viscosity at 135 °C, Maximum, Pa·s	T316	3.0	3.0	3.0
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G' / sin(delta), kPa	T315	64 1.00	64 1.00	70 1.00
RTFO Test ^e , Mass Loss, Maximum, %	T240	1.00	1.00	1.00
RTFO Test Aged Binder				
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G' / sin(delta), kPa	T315	64 2.20	64 2.20	70 2.20
Ductility at 25 °C Minimum, cm	T51	75	75	75
PAV ^f Aging, Test Temperature, °C	R28	100	100	110
RTFO Test and PAV Aged Binder				
Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum G' / sin(delta), kPa	T315	31 ^d 5000	28 ^d 5000	34 ^d 5000
Creep Stiffness, Test Temperature, °C Maximum S-value, Mpa Minimum M-value	T313	0 300 0.300	-6 300 0.300	0 300 0.300

Notes:

- a. Not used.
- b. The Engineer will waive this specification if the supplier is a Quality Supplier as defined by Department's "Certification Program for Suppliers of Asphalt".
- c. The Engineer will waive this specification if the supplier certifies the asphalt binder can be adequately pumped and mixed at temperatures meeting applicable safety standards.
- d. Test the sample at 3 °C higher if it fails at the specified test temperature. G' sin(delta) shall remain 5000 kPa maximum.
- e. "RTFO Test" means the asphaltic residue obtained using the Rolling Thin Film Oven Test, AASHTO Test Method T240 or ASTM Designation: D2827.
- f. "PAV" means Pressurized Aging Vessel.

Aggregate

Aggregates shall be clean and free from decomposed materials, organic material, and other deleterious substances. Coarse aggregate is material retained on the No. 4 sieve and fine aggregate is material passing the No. 4 sieve. Supplemental fine aggregate is added fine material passing the No. 30 sieve including, but not limited to, cement and stored fines from dust collectors.

The aggregate grading of the different types of hot mix asphalt shall conform to the following, unless otherwise specified on the plans:

HMA Type	Grading
A	3/4-inch
C	1-inch

The combined aggregate and quality characteristics for the aggregate for use in HMA Type A as specified in the table above, prior to addition of asphalt binder, shall conform to the requirements of Section 39-1.02E, "Aggregate" of the Standard Specifications.

The combined aggregate and quality characteristics for the 1-inch aggregate for use in HMA Type C as specified in the table above, prior to addition of asphalt binder, shall conform to the requirements in this Section, "Aggregate."

Aggregate Gradation (Percentage Passing) HMA Type C

1-inch HMA Type C		
Sieve Sizes	Target Value Limits	Allowable Tolerance
1"	100	—
3/4"	88 - 93	TV \pm 5
1/2"	72 - 85	TV \pm 6
3/8"	55 - 70	TV \pm 6
No. 4	35 - 52	TV \pm 7
No. 8	22 - 40	TV \pm 5
No. 30	8 - 24	TV \pm 4
No. 50	5 - 18	TV \pm 4
No. 200	3 - 7	TV \pm 2

The aggregate shall conform to the following quality requirements prior to the addition of asphalt binder.

Aggregate Quality for HMA Type C

Quality Characteristic	Test Method	Requirement
Percent of crushed particles ^a Coarse aggregate (% min.) Two fractured faces	CT 205	95
Fine aggregate (Passing No. 4 sieve and retained on No. 8 sieve.) (% min.) One fractured face		90
Los Angeles Rattler (% Max.) ^a Loss at 100 rev. Loss at 500 rev.	CT 211	12
		40
Sand equivalent ^{a, b} (min.)	CT 217	47
Fine aggregate angularity (% min.) ^a	CT 234	45
Flat and elongated particles (% max. by weight @ 5:1.) ^a	CT 235	10

Note:

^a Combine aggregate in the JMF proportions.

^b Reported value must be the average of 3 tests from a single sample.

Lift Thickness

Hot mix asphalt shall be spread and compacted in the number of layers of the thicknesses indicated in the following table unless otherwise specified on the plans or in the Special Provisions:

Total Thickness Shown on Plans ^a	Minimum No. of Layers	Top Layer Thickness (ft)		Next Lower Layer Thickness (ft)		All Other Lower Layer Thickness (ft)	
		Min.	Max.	Min.	Max.	Min.	Max.
0.24-foot or less	1	-	-	-	-	-	-
0.25-foot	2 ^b	0.12	0.13	0.12	0.13	-	-
0.26 - 0.46 foot	2	0.12	0.21	0.14	0.25	-	-
0.47-foot or more	3 or more	0.15	0.21	0.15	0.25	0.17	0.25

^a When pavement reinforcing mat is shown to be placed between layers of asphalt concrete, the thickness of asphalt concrete above the pavement reinforcing mat shall be considered to be the "Total Thickness Shown on Plans."

^b One layer of 0.25 foot thick may be placed as approved by the Engineer. When the Traffic Index specified is 5.5 or below, two layers shall be placed.

Lift thickness and HMA type for Clinton Keith Road are as follows:

Total HMA Thickness Shown on Plans	No. of Layers	Top Layer (ft)	Next Lower Layer (ft)	All Other Lower Layer (ft)
0.35-foot	2	0.18 Type A	0.17 Type A	-
0.50-foot	2	0.20 Type A	0.30 Type C	-
0.65-foot	3	0.17 Type A	0.23 Type C	0.25 Type C

Reclaimed Asphalt Pavement

The use of reclaimed asphalt pavement (RAP) in HMA production shall comply to Section 39-1.02F, "Reclaimed Asphalt Pavement" of the Standard Specifications, and this Section. Use of RAP in HMA Type C will be allowed at a maximum of 15 percent.

HMA Mix Design

The HMA mix design shall conform to Section 39-1.03B, "Hot Mix Asphalt Mix Design" of the Standard Specifications and the provisions of this Section, "HMA Mix Design." The mix design process consists of performing California Test 367 and laboratory procedures in combinations of aggregate gradations and asphalt binder contents to determine the optimum binder content (OBC) and HMA mixture qualities. The results become the proposed job mix formula (JMF).

The Contractor shall submit records of aggregate quality and mix design data. Test data shall be within one year from the last test performed.

The Contractor shall submit the HMA mix design using the "COUNTY OF RIVERSIDE TRANSPORTATION DEPARTMENT, CONTRACTOR JOB MIX FORMULA PROPOSAL" form to present the JMF. Formats other than the referenced form will not be accepted. Refer to Appendix E for the JMF form.

The final HMA mix design shall be signed and stamped by a Civil Engineer registered in the State of California.

The mix design for HMA Type A shall comply with the requirements in Section 39-1.03B of the Standard Specifications.

The HMA mix design for Type C shall conform with the following requirements:

During mix design preparation for HMA Type C, determine the optimum binder content (OBC) at 5 percent air voids content. Determine the proposed JMF from a mix design that complies with the following table:

HMA Type C Mix Design Requirements

Quality characteristic	Test method	Value	
Design air void content (%)		4.0	5.0
Air void content (%) ^a	CT 367	4.0	5.0
Voids in mineral aggregate (% min) ^b	CT 367		
3/4" grading		13.0	14.0
1" grading			
with NMAS = 1"		12.0	13.0
with NMAS = 3/4"		13.0	14.0
Voids filled with asphalt (%)	CT 367		
3/4" grading		65.0–75.0	60.0–70.0
1" grading		65.0–75.0	60.0–70.0
Dust proportion ^c (P200/Pbe)	CT 367	0.6–1.2	0.6–1.2
Stabilometer value (min) ^d	CT 366	37 ^e	37 ^e
		(Modified) 35 ^f	(Modified) 35 ^f

^a Calculate the air void content of each specimen using California Test 309 and 367. Modify California Test 367, Paragraph C5, to use the exact air void content specified in the selection of OBC.

^b Minimum voids in the mineral aggregate (VMA) is dependent upon the nominal maximum aggregate size (NMAS) of JMF. NMAS is defined as 1 sieve size larger than the 1st sieve to retain more than 10 percent.

^c Asphalt content based on total weight of mix.

^d California Test 304, Part 2C.12.

^e Comply with California Test 366: 150 tamps at 500 psi tamping pressure and 230 °F compaction temperature; cool specimens to 140 °F; apply 12,600 lb leveling load; and perform stabilometer test at 140 °F.

^f Modify California Test 366: 150 tamps at 500 psi tamping pressure and 230 °F compaction temperature; cool specimens to 140 °F; apply additional 500 tamps at 500 psi; apply 12,600 lb leveling load; and perform stabilometer test at 140 °F.

Sampling

The Contractor or the Contractor's representative shall provide a sampling device in the asphalt feed line connecting the plant storage tanks to the asphalt weighing system or spray bar. The sampling device shall be accessible between 24 and 30 inches above the platform. The Contractor shall provide a receptacle for flushing the sampling device.

The sampling device shall include a valve:

1. With a diameter between 1/2 and 3/4 inches;
2. Manufactured in a manner that a one-quart sample may be taken slowly at any time during plant operations;
3. Maintained in good condition.

The Contractor shall replace failed valves.

In the presence of the Engineer, the Contractor shall take 2 one-quart samples per operating day. The Contractor shall provide round friction top containers with one-quart capacity for storing samples.

Prime Coat

Liquid asphalt for prime coat shall conform to the provisions in Section 93, "Liquid Asphalts" of the Standard Specifications and shall be **Grade SC-70**. Prime coat shall be applied only to those areas designated by the Engineer. The application rate shall be 0.20 gallon per square yard of surface covered. The exact rate and number of applications will be determined by the Engineer.

Tack Coat

Asphaltic emulsion for paint binder (tack coat) shall conform to the provisions in Section 94, "Asphaltic Emulsion" of the Standard Specifications for the rapid-setting, slow-setting, or polymer-modified type and grade approved by the Engineer. **Grade SS1h** shall be used if not otherwise specified. Tack coat shall be applied to all vertical surfaces of existing pavement, curbs, gutters, and construction joints in the surfacing against which additional material is to be placed, to a pavement to be surfaced, and to other surfaces designated in the Special Provisions. The application rate shall be from 0.02 to 0.10 gallon per square yard of surface covered. The exact rate and number of applications will be determined by the Engineer. Application of tack coat shall meet the provisions in Section 39-1.09C of the Standard Specifications.

Control of Materials

All proposed materials for use in HMA shall be furnished in conformance with the provisions of Section 6, "Control of Materials" of the Standard Specifications and this Section. All materials to be used in producing the hot mix asphalt shall be supplied from a single source for each material unless approved by the Engineer. Materials to be used in HMA will be subject to inspection and tests by the Engineer. The Contractor shall furnish without charge sample of materials as may be required.

The Contractor shall furnish the Engineer a list of the Contractor's sources of materials and the locations at which those materials will be available for inspection. The Contractor shall assure that the Engineer has free access or entry at all times to the material or production of the material to be inspected, sampled, and tested. It is understood that the inspections and tests made at any point shall, in no way, be considered as a guaranty of acceptance of the material nor continued acceptance of the material presumed to be similar to that upon which inspections and tests have been made, and that inspection and testing performed by the Engineer shall not relieve the Contractor of responsibility for quality control.

All materials which the Engineer has determined defective or do not conform to the requirements of the plans and specifications will be rejected whether in place or not. Under the provisions of this Section, the Engineer will have authority to cause the removal and replacement of rejected material and to deduct the cost thereof from any moneys due or to become due the Contractor.

Utility Covers

The Contractor shall adjust to finish grade any valve covers encountered within the project limits, as required, for those utility valves that are provided with slip cans and are adjustable without the replacement of part or the removal of concrete collars. In cases where the owning utility company insists upon upgrades in the standards, or when additional parts or the removal of concrete collars are required for the adjustment, said adjustment will be the responsibility of the owning utility company.

The Contractor shall lower manholes and valves when and as necessary for the protection of the traveling public during construction, and shall coordinate all work on said facilities with the owning utility companies. Final adjustment to grade will be the responsibility of the owning utility company, except as provided herein.

Production of HMA

Production of HMA shall be in conformance with the provisions in Section 39-1.08 of the Standard Specifications.

Placing HMA

Asphalt paving equipment shall be in conformance with the provisions of Section 39-1.10, "Spreading and Compacting Equipment" of the Standard Specifications. Spreading and Compacting shall be in accordance with this Section and the provisions in Section 39-1.11, "Transporting, Spreading, and Compacting" of the Standard Specifications, except QC/QA construction process does not apply.

When placing asphalt concrete to the lines and grades established by the Engineer, the automatic controls shall control the longitudinal grade and transverse slope of the screed. Grade and slope references shall be furnished, installed, and maintained by the Contractor. Should the Contractor elect to

use a ski device, the minimum length of the ski device shall be 30 feet. The ski device shall be a rigid one piece unit and the entire length shall be utilized in activating the sensor.

When placing the initial mat of asphalt concrete on existing pavement, the end of the screed nearest the centerline shall be controlled by a sensor activated by a ski device not less than 30 feet. The end of the screed farthest from centerline shall be controlled by an automatic transverse slope device set to reproduce the cross slope designated by the Engineer, by a sensor activated by a similar ski device or as directed by the Engineer.

When paving contiguously with previously placed mats, the end of the screed adjacent to the previously placed mat shall be controlled by a sensor that responds to the grade of the previously placed mat and will reproduce the grade in the new mat within a 0.12 inch tolerance. The end of the screed farthest from the previously placed mat shall be controlled in the same way it was controlled when placing the initial mat.

Should the methods and equipment furnished by the Contractor fail to produce a layer of asphalt concrete conforming to the provisions, including straightedge tolerance, of Section 39-1.11, "Transporting, Spreading, and Compacting" of the Standard Specifications or elsewhere in these Special Provisions, the paving operations shall be discontinued and the Contractor shall modify the equipment or methods, or furnish substitute equipment.

Should the automatic screed controls fail to operate properly during a day's work, the Contractor may manually control the spreading equipment for the remainder of that day. However, the equipment shall be corrected or replaced with alternative automatically controlled equipment conforming to the provisions in this section before starting another day's work.

Construction Process of HMA

The HMA construction process shall comply with the provisions of Section 39 of the Standard Specification, the provisions of these Special Provisions, and shall include one or more of the following.

1. Standard
2. Method

The HMA construction process for Clinton Keith Road is **Standard**.

Standard

When the total HMA is more than 3,000 tons, the Standard construction process shall be followed as specified in Section 39-2, "Standard Construction Process" of the Standard Specification and the following:

When the total paved HMA thickness is at least 0.15 foot and the individual layer is more than 0.15 foot, the Contractor shall determine the in-place density and relative compaction of HMA pavement in accordance with the procedures of California Test 375. The Contractor shall use California Test 308, Method A, in determining in-place density of each density core instead of using the nuclear gauge in Part 4, "Determining In-Place Density by the Nuclear Density Device." The Contractor shall use California Test 309 to determine the maximum theoretical density instead of calculating test maximum density in Part 5, "Determining Test Maximum Density" and shall be at the frequency specified for Test Maximum Density under California Test 375, Part 5D. Relative compaction is required for HMA Type A and HMA Type C and shall be reported at various pave thicknesses as listed in the following table:

HMA Relative Compaction Requirements

HMA	Minimum Pave Thickness (ft)	Relative Compaction (%)
Type A (3/4-inch)	0.15	91-97
Type C (1-inch)	0.25	91-97

The Contractor shall perform quality control sampling and testing at the specified frequency for the quality characteristics shown in the following table:

Quality characteristic	Test method	Minimum sampling and testing frequency	HMA Type	
			A	C
Aggregate gradation ^a	California Test 202	1 per 750 tons and any remaining part	JMF ± Tolerance ^b	JMF ± Tolerance ^b
Sand equivalent (min) ^c	California Test 217		47	47
Asphalt binder content (%)	California Test 379 or 382		JMF ± 0.45	JMF ± 0.45
HMA moisture content (% , max)	California Test 226 or 370	1 per 1,500 tons but not less than 1 per paving day	1.0	1.0
Percent of maximum theoretical density (%) ^{d, e}	QC plan	1 per day's production (min.)	91-97	91-97
Stabilometer value (min) ^{c, f} 1/2" and 3/4" gradings 1" gradings	California Test 366	One per 1,500 tons or 2 per 5 business days, whichever is greater	37	--
			--	37
Air void content (%) ^{c, g}	California Test 367		4 ± 2	5 ± 2
Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants ^h	California Test 226 or 370	2 per day during production	--	--
Percent of crushed particles coarse aggregate (% , min) One fractured face Two fractured faces Fine aggregate (% , min) (Passing no. 4 sieve and retained on no. 8 sieve.) One fractured face	California Test 205	As designated in the QC plan. At least once per project.	90	90
			75	95
			70	90
Los Angeles Rattler (% , max) Loss at 100 rev. Loss at 500 rev.	California Test 211		12	12
			45	40
Flat and elongated particles (% , max by weight @ 5:1)	California Test 235	As designated in the QC plan. At least once per project.	Report only	10
Fine aggregate angularity (% , min)	California Test 234		45	45

Voids filled with asphalt (%) ⁱ 1/2" grading 3/4" grading 1" grading	California Test 367		65.0–75.0 65.0–75.0	60.0–70.0
Voids in mineral aggregate (% min) ⁱ 1/2" grading 3/4" grading 1" grading	California Test 367		14.0 13.0	13.0
Dust proportion ¹ 1/2" and 3/4" gradings 1" grading	California Test 367		0.6–1.3	0.6–1.3
Smoothness	Section 39-1.12	--	12-foot straight-edge, must grind, and PI ₀	12-foot straight-edge, must grind, and PI ₀

Failures and corrected actions for quality control testing shall be as described in Section 39-2.02B, "Quality Control Testing."

When the total paved HMA thickness is at least 0.15 foot and the individual layer is less than or equal to 0.15 foot, the Contractor shall determine the percent of maximum theoretical density from density cores taken from the final layer measured at the full depth of the total paved HMA thickness.

Method

When the total HMA is less than 3,000 tons and the total paved HMA thickness is less than 0.15 foot, the Method construction process shall be followed as specified in Section 39-3, "Method Construction Process" of the Standard Specification and the following:

The requirements for HMA Type C using the Method process shall be similar to the requirements for HMA Type A as specified in Section 39-3, "Method Construction Process" of the Standard Specifications.

HMA Acceptance and Payment Factor

The Engineer shall sample for acceptance testing and test for quality characteristics as specified in Section 39-2.03A, "Testing." Acceptance of placed HMA shall be based on a single defined lot of HMA. A lot is defined as having 1,000 tons of paved HMA, except if a quantity of HMA paved at day's end is greater than 500 tons, this quantity of paved HMA shall be considered a lot. If a quantity of HMA paved at day's end is less than 500 tons, this quantity of HMA shall be included in the previous lot's test result for payment evaluation.

For percent of maximum theoretical density, the Engineer shall determine a deduction for each lot's test result outside the specifications using the following reduced payment factors:

Reduced Payment Factors for Percent of Maximum Theoretical Density

HMA Type A and C percent of maximum theoretical density	Reduced payment factor	HMA Type A and C percent of maximum theoretical density	Reduced payment factor
91.0	0.0000	97.0	0.0000
90.9	0.0125	97.1	0.0125
90.8	0.0250	97.2	0.0250
90.7	0.0375	97.3	0.0375
90.6	0.0500	97.4	0.0500
90.5	0.0625	97.5	0.0625
90.4	0.0750	97.6	0.0750
90.3	0.0875	97.7	0.0875
90.2	0.1000	97.8	0.1000
90.1	0.1125	97.9	0.1125
90.0	0.1250	98.0	0.1250
89.9	0.1375	98.1	0.1375
89.8	0.1500	98.2	0.1500
89.7	0.1625	98.3	0.1625
89.6	0.1750	98.4	0.1750
89.5	0.1875	98.5	0.1875
89.4	0.2000	98.6	0.2000
89.3	0.2125	98.7	0.2125
89.2	0.2250	98.8	0.2250
89.1	0.2375	98.9	0.2375
89.0	0.2500	99.0	0.2500
< 89.0	Remove and replace	> 99.0	Remove and replace

Density Cores

The Engineer shall test density cores to determine the percent of maximum theoretical density of the paved HMA. For Standard construction process projects, 4- or 6-inch diameter density cores shall be taken by the Contractor from each 500 tons of HMA production.

The Engineer shall determine the percent of maximum theoretical density from the average density of 3 density cores taken by the Contractor from every 500 tons of production or part thereof divided by the maximum theoretical density. The location of the density cores shall be randomly selected by the Engineer and shall be performed in the Engineer's presence. Density holes shall be backfilled and compacted with material approved by the Engineer. Density cores shall be marked with the density core's location and layer number and shall be placed in a protective container. If a density core is damaged, it shall be replaced and re-cored within 1 foot longitudinally from the original density core.

Straightedge

The straightedge for smoothness determination on the top layer of HMA pavement shall conform to the tolerance specified in Section 39-1.12B, "Straightedge" of the Standard Specifications.

Profilograph

In addition to the straightedge provisions in Section 39-1.12B, "Straightedge" of the Standard Specifications, HMA concrete pavement shall conform to the surface tolerances specified in this Section, "Profilograph."

When directed by the Engineer, the uppermost layer of asphalt concrete surfacing shall be profiled in the presence of the Engineer using a California Profilograph or equivalent in conformance with California Test

526, Section 39-1.12C, "Profilograph" of the Standard Specifications, and as specified in these Special Provisions.

The California Profilograph or equivalent will not be required for the following areas of the pavement surface but shall conform to the straightedge requirements in Section 39-1.12B, "Straightedge" of the Standard Specifications:

1. Pavement with a total thickness less than 0.24 foot;
2. Pavement on horizontal curves with a centerline curve radius of less than 1,000 feet and the pavement within the superelevation transition on those curves;
3. Pavement placed in a single lift when required by the Special Provisions;
4. Pavement with extensive grade or cross slope correction which does not receive advance leveling operations in conformance with the provisions in Section 39-6.02, "Spreading" of the Standard Specifications;
5. Pavement for ramps and connectors with steep grades and high rates of superelevation, as determined by the Engineer;
6. Shoulders and miscellaneous areas.

The Contractor shall conform to California Test 526, except a zero (null) blanking band shall be used for determining the Profile Index. Prior to beginning profiles, the profilograph shall be calibrated in the presence of the Engineer. Two profiles shall be obtained within each traffic lane, 3 feet from and parallel with the edges of the lane.

Pavements profiled shall conform to the following Profile Index requirements:

1. Pavement on tangent alignment and pavement on horizontal curves having a centerline curve radius of 2,000 feet or more shall have a Profile Index of 0.16 foot or less for each 330 feet section profiled;
2. Pavement on horizontal curves having a centerline curve radius of 1,000 feet or more but less than 2,000 feet, including the pavement within the superelevation transition of these curves, shall have a Profile Index of 0.32 foot or less for each 330 feet section profile;
3. Pavement within any 330 feet section, containing high point areas with deviations in excess of 0.025 foot in a length of 25 feet or less, when tested in conformance with the requirements in California Test 526, shall be corrected by the Contractor regardless of the Profile Index.

The Contractor shall complete initial runs of the profilograph prior to opening the pavement to public traffic. If initial profiles cannot be made prior to opening the pavement to public traffic, the initial runs of the profilograph shall be made the next day that traffic control is permitted for the area to be profiled.

Areas of the top surface of the uppermost layer of asphalt concrete pavement that do not meet the specified surface tolerances shall be brought within tolerance by abrasive grinding.

Abrasive grinding shall be performed to reduce individual deviations in excess of 0.025 foot, and to reduce the Profile Index of the pavement to be within the specified tolerance. Areas which have been subjected to abrasive grinding shall receive a seal coat. Deviations in excess of 0.025 foot which cannot be brought into specified tolerance by abrasive grinding shall be corrected by either (1) removal and replacement or (2) placing an overlay of asphalt concrete. The corrective method for each area shall be selected by the Contractor and shall be approved by the Engineer prior to beginning the corrective work. Replacement or overlay pavement not meeting the specified tolerances shall be corrected by the methods specified above. Corrective work shall be at the Contractor's expense. The Contractor shall run profilograms on the areas that have received abrasive grinding or corrective work until the final profilograms indicate the Profile Index of the area is within the specified tolerance.

When abrasive grinding is used to bring the top surface of the uppermost layer of asphalt concrete surfacing within the specified surface tolerances, additional abrasive grinding shall be performed as necessary to extend the area ground in each lateral direction so that the lateral limits of grinding are at a constant offset from, and parallel with, the nearest lane line or pavement edge, and in each longitudinal direction so that the grinding begins and ends at lines normal to the pavement centerline, within a ground area. Ground areas shall be neat rectangular areas of uniform surface appearance.

The original of the final profilograms that indicate the pavement surface is within the Profile Index specified shall become the property of the County and shall be delivered to the Engineer prior to acceptance of the contract.

Method of Payment

The contract bid price paid per ton for Hot Mix Asphalt (HMA) for the type shown in bid proposal shall include full compensation for furnishing all labor, tools, materials, equipment, and incidentals, and for doing all the work involved including the sampling and testing of HMA for Standard process, quality characteristics, sampling and testing of density cores, and furnishing and applying asphaltic emulsion (paint binder/tack coat).

At road connections and at limits of asphalt paving, existing pavement shall be header cut as shown on the plans or as directed by the Engineer. Full compensation for furnishing all labor, tools and doing all the work necessary including grinding, and sawcutting shall be considered as included in the contract prices paid per ton for the various asphalt concrete items and no additional compensation will be allowed therefor.

Full compensation for furnishing and applying asphaltic emulsion (paint binder/tack coat) shall be considered as included in the contract price paid for Hot Mix Asphalt.

The placing of Hot Mix Asphalt (miscellaneous area), AC Dike and overside Drain shall be paid for at the separate contract unit shown in the bid proposal in addition to the price paid for the materials other than Hot Mix Asphalt involved.

The adjustment of frames, valve covers, grates, manholes, including initial lowering of valves and manholes when required, shall be considered as included in the contract price paid for hot mix asphalt.

Add to section 39-6:

COMPENSATION ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS:

The provisions of this section shall apply only to the following contract items:

ITEM CODE	ITEM
390129	Hot Mix Asphalt (Type C)
390132	Hot Mix Asphalt (Type A)

The compensation payable for hot mix asphalt and rubberized hot mix asphalt will be increased or decreased in conformance with the provisions of this section for paving asphalt price fluctuations exceeding 10 percent (Iu/Ib is greater than 1.10 or less than 0.90) which occur during performance of the work.

The adjustment in compensation will be determined in conformance with the following formulae when the item of asphalt concrete and asphalt rubber hot mix are included in a monthly estimate:

- A. Total monthly adjustment = AQ
- B. For an increase in paving asphalt price index exceeding 10 percent:
 $A = 0.90 (Iu/Ib - 1.10) Ib$
- C. For a decrease in paving asphalt price index exceeding 10 percent:
 $A = 0.90 (Iu/Ib - 0.90) Ib$
- D. Where:

The Engineer will conduct the meeting. Be prepared to discuss the following:

1. Pile placement plan, dry and wet
2. Acceptance testing, including gamma-gamma logging, cross-hole sonic logging, and coring
3. *Pile Design Data Form*
4. Mitigation process
5. Timeline and critical path activities
6. Structural, geotechnical, and corrosion design requirements
7. Future meetings, if necessary, for pile mitigation and pile mitigation plan review
8. Safety requirements, including Cal/OSHA and Tunnel Safety Orders

Add to section 49-3.02A(4)(d)(ii):

If inspection pipes are not shown:

1. Include in the pile installation plan a plan view drawing of the pile showing reinforcement and inspection pipes.
2. Place inspection pipes radially around the pile, inside the outermost spiral or hoop reinforcement and no more than 1 inch clear of the outermost spiral or hoop reinforcement.
3. Place inspection pipes around the pile at a uniform spacing not exceeding 33 inches measured along the circle passing through the centers of inspection pipes. Use at least 2 inspection pipes per pile. Place inspection pipes to provide the maximum diameter circle that passes through the centers of the inspection pipes while maintaining the spacing required herein.
4. Place inspection pipes at least 3 inches clear of the vertical reinforcement. Where the vertical reinforcement configuration does not allow this clearance while achieving radial location requirements, maximize the distance to vertical rebar while still maintaining the requirement for radial location.

Where the dimensions of the pile reinforcement do not allow inspection pipes to be placed as specified above, submit a request for deviation before fabricating pile reinforcement.

Add to section 49-3.02B(6)(c):

The synthetic slurry must be one of the materials shown in the following table:

Material	Manufacturer
SlurryPro CDP	KB INTERNATIONAL LLC 735 BOARD ST STE 209 CHATTANOOGA TN 37402 (423) 266-6964
Super Mud	PDS CO INC 105 W SHARP ST EL DORADO AR 71731 (870) 863-5707
Shore Pac GCV	CETCO CONSTRUCTION DRILLING PRODUCTS 2870 FORBS AVE HOFFMAN ESTATES IL 60192 (800) 527-9948
Terragel or Novagel Polymer	GEO-TECH SERVICES LLC 220 N. ZAPATA HWY STE 11A-449A LAREDO TX 78043 (210) 259-6386

Use synthetic slurries in compliance with the manufacturer's instructions. Synthetic slurries shown in the above table may not be appropriate for a given job site.

Synthetic slurries must comply with the Department's requirements for synthetic slurries to be included in the above table. The requirements are available from the Offices of Structure Design, P.O. Box 168041, MS# 9-4/11G, Sacramento, CA 95816-8041.

SlurryPro CDP synthetic slurry must comply with the requirements shown in the following table:

SLURRYPRO CDP

Property	Test	Value
Density During drilling	Mud Weight (density), API 13B-1, section 1	≤ 67.0 pcf ^a
Before final cleaning and immediately before placing concrete		≤ 64.0 pcf ^a
Viscosity During drilling	Marsh Funnel and Cup. API 13B-1, section 2.2	50–120 sec/qt
Before final cleaning and immediately before placing concrete		≤ 70 sec/qt
pH	Glass electrode pH meter or pH paper	6.0–11.5
Sand content, percent by volume Before final cleaning and immediately before placing concrete	Sand, API 13B-1, section 5	≤ 0.5 percent

^aIf authorized, you may use slurry in salt water. The allowable density of slurry in salt water may be increased by 2 pcf.

Slurry temperature must be at least 40 degrees F when tested.

Super Mud synthetic slurry must comply with the requirements shown in the following table:

SUPER MUD

Property	Test	Value
Density During drilling	Mud Weight (Density), API 13B-1, section 1	≤ 64.0 pcf ^a
Before final cleaning and immediately before placing concrete		≤ 64.0 pcf ^a
Viscosity During drilling	Marsh Funnel and Cup. API 13B-1, section 2.2	32–60 sec/qt
Before final cleaning and immediately before placing concrete		≤ 60 sec/qt
pH	Glass electrode pH meter or pH paper	8.0–10.0
Sand content, percent by volume Before final cleaning and immediately before placing concrete	Sand, API 13B-1, section 5	≤ 0.5 percent

^aIf authorized, you may use slurry in salt water. The allowable density of slurry in salt water may be increased by 2 pcf.

Slurry temperature must be at least 40 degrees F when tested.

51-1.01A(3) Payment

Installation of the Wildlife Overcrossing will be paid for on the basis of lump sum price.

The lump sum price paid for installation of Wildlife Overcrossing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing the work involved installing the Wildlife Overcrossing as shown on the plans, and as specified on the specifications shown on the plans, and as directed by the Engineer.

Add to section 51-1.01C(1):

If the methacrylate crack treatment is performed within 100 feet of a residence, business, or public space, submit a public safety plan that includes the following:

1. Public notification letter with a list of delivery and posting addresses. The letter must describe the work to be performed and state the treatment work locations, dates, and times. Deliver the letter to residences and businesses within 100 feet of overlay work and to local fire and police officials not less than 7 days before starting overlay activities. Post the letter at the job site.
2. Airborne emissions monitoring plan. A CIH certified in comprehensive practice by the American Board of Industrial Hygiene must prepare and execute the plan. The plan must have at least 4 monitoring points including the mixing point, application point, and point of nearest public contact. Monitor airborne emissions during overlay activities.
3. Action plan for protecting the public if levels of airborne emissions exceed permissible levels.
4. Copy of the CIH's certification.

After completing methacrylate crack treatment activities, submit results from monitoring production airborne emissions as an informational submittal.

Add to section 51-1.02B:

Replace the 1st paragraph in section 51-1.03F(5)(b)(i) with:

Except for bridge widening, texture the bridge deck surfaces longitudinally by grinding and grooving.

Replace the 6th paragraph in section 51-2.02D(2)(b) with:

Size the recess such that the primary reinforcement for structural members is outside the recess. The maximum depth at abutments is 10 inches. The maximum width on each side of the expansion joint is 12 inches.

Add to section 51-1.04:

Payment for constructing concrete saddle utility supports, including bar reinforcing steel and all incidentals, is included in the payment for structural concrete, bridge.

Add as section 51-7.03:

51-7.03 WILDLIFE UNDERCROSSING SKYLIGHT

51-7.03A General

Section 51-7.03 includes specifications for constructing wildlife undercrossing skylight.

This work shall consist of furnishing and constructing a reinforced concrete pipe riser inlet with a steel grate connected over the wildlife undercrossing pipe and shall conform to requirements and details shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

51-7.03B Materials

Concrete for wildlife undercrossing skylight must comply with section 51-7

Reinforced concrete pipe for pipe risers must comply with section 65-2

ADS Sanitite HP pipe shall be watertight according to the requirements of ASTM D3212, with the addition of a 15 psi pressure requirement. Spigots shall have two gaskets meeting the requirements of ASTM F477.

Joints for pipes shown as watertight must be watertight under pressure and all conditions of expansion, contraction, and settlement, and must comply with section 61-1.01D(1)(b) for water tightness.

64-1.02F(5) Construction

The Contractor shall provide and verify measurements in the field for pipe installation to fit field conditions as required by pipe manufacturer to complete the work.

ADS Sanitite HP Pipe shall be installed and fastened to the supports in accordance with the pipe manufacturer's recommendation.

Gaskets shall be installed by the pipe manufacturer or approved installer, and covered with a removable, protective wrap to ensure gaskets are free from debris. A joint lubricant from the manufacturer shall be used on the gasket and bell during installation.

ADS Sanitite HP pipe shall have a reinforced bell with a polymer composite band installed by the manufacturer or approved installer.

ADS Sanitite HP pipe shall be installed and jointed in conformance with the manufacturer's recommendations.

ADS Sanitite HP Pipe shall be installed to the lines and grades with sections closely jointed and secured to ensure that no separation of the ADS Sanitite HP pipe once they are secured in place.

64-1.02F(6) Payment

ADS Sanitite HP pipe is measured along the centerline of the pipe and parallel with the slope line. The payment quantity includes the length of elbows, wyes, tees, and other branches to the point of intersection. The payment quantity is the length designated by the Engineer.

65 CONCRETE PIPE

Add to section 65-4:

65-4.01 WILDLIFE UNDERCROSSING

65-4.01A General

Section 65-4.01 includes specifications for constructing wildlife undercrossing.

This work shall consist of furnishing and constructing a concrete ledge within a reinforced concrete pipe and shall conform to requirements and details shown on the plans, as specified in the Standard Specifications and these Special Provisions, and as directed by the Engineer.

Earthwork must comply with section 19-3.

Reinforced concrete pipe must comply with section 65-2.

65-4.01B Materials

All reinforced concrete pipe for wildlife undercrossing to be furnished and installed under section 65-4 shall be Class IV.

Concrete for wildlife undercrossing ledge must comply with the specifications for minor concrete.

Alternative materials may be used if approved by the Engineer. Submit material data sheets and contractor installation method for the Engineer's approval. Alternative materials shall be protected against corrosion.

65-4.01C Construction

You may construct forms for ledge using any material that produces the dimensions shown.

3. Grates and frames must be one piece anchored into the body of the line drain unless shown as removable. Removable grates must be separate from the frame and must:
 - 3.1. Be held in place by locking devices that are tamper resistant
 - 3.2. Provide a minimum repetitive pullout resistance of 340 lb/ft of length after completion of 1,000 hours of salt spray testing under ASTM B 117
 - 3.3. Be match marked in pairs before delivery to the work and grates must fit into the frames without rocking
4. If a combination of one piece frame and grate and removable grates are used, the locations of the removable grates are shown
5. Except for grates installed within designated pedestrian paths of travel, grate design must accept inflow of runoff through openings consisting of a minimum of 60 percent of the total top surface area of the grate. Individual openings or slots must have a dimension not greater than 2 inches measured in the direction of the grated line drain flow line.
6. Grates installed within designated pedestrian paths of travel must be certified as conforming to the requirements of the Americans with Disabilities Act.

70-6.03 CONSTRUCTION

Excavation and backfill must comply with section 19-3.

Grated line drains must be installed in trenches excavated to the lines and grades established by the Engineer. Grade and prepare the bottom of the trench to provide a firm and uniform bearing throughout the entire length of the grated line drain.

Installation of grated line drains and joints must comply with the manufacturer's instructions.

Install to the lines and grades with sections closely jointed and secured to ensure that no separation of the line drains occurs during backfilling.

The frame or grate must not extend above the level of the surrounding concrete backfill.

Connect grated line drains to new or existing drainage facilities as shown.

Backfill with minor concrete.

Place concrete backfill in the trench as shown. Place against undisturbed material at the sides and bottom of the trench in a manner that prevents (1) floating or shifting of the grated line drain and voids or (2) segregation in the concrete.

Immediately remove foreign material that falls into the trench before or during placement of the concrete.

Where necessary construct and compact earth plugs at the ends of the concrete backfill to contain the concrete within the trench.

Secure frames or line drain wall to the surrounding concrete backfill with steel anchoring rods as shown. Alternative securing methods must provide a minimum pullout resistance of 685 lb/ft of length of grated line drain frame.

Concrete backfill must be finished flush with the adjacent surfacing.

The surface of the concrete must be textured with a broom or burlap drag to produce a durable skid-resistant surface.

70-6.04 PAYMENT

Payment for frames and grates is included in the payment for grated line drain.

AA

DIVISION VIII MISCELLANEOUS CONSTRUCTION

73 CONCRETE CURBS AND SIDEWALKS

Add to section 73-2.03A:

Concrete curb within the limits of bus turnouts shall be constructed monolithically with the Portland cement concrete paving of the bus turnout.

Add to section 73-2.04:

Concrete curb constructed monolithically with the bus turnout concrete paving will be measured and paid for by the cubic yard as Minor Concrete (Bus Turnout).

AA

75 MISCELLANEOUS METAL

Add to the list in the 2nd paragraph of section 75-1.03A:

- 6. Two – 20” steel casing for water line (one at each abutment)
- 7. Storm drain support for 36 inch storm drain
- 8. Steel hangers for water line, telecommunication, electric and fiber optic lines.
- 9. Soffit opening grates
- 10. Three Deck Access Openings

Add as section 75-1.03J:

75-1.03J FIBERGLASS REINFORCED PLASTIC (FRP) GRATING:

75-1.03J(2) General

Section 75-1.03J consists of furnishing and installing fiberglass reinforced plastic (FRP) grating, with hold-down and fastening clips, metal support systems, and associated items as shown on the plans and in conformance with these Special Provisions. The primary purpose of the FRP grating system is to aesthetically conceal the storm drain pipe located between the girders under the Warm Springs Creek bridge deck and is not designed for use as walkway or access support.

75-1.03J(3) Submittals

Submit a certificate of compliance for Fiberglass Reinforced Plastic (FRP) Grating.

Certificate of Compliance must be in conformance with the provisions in Section 6-3.05E, "Certificates of Compliance," of the Standard Specifications.

75-1.03J(4) Materials

FIBERGLASS GRATING

Fiberglass grating shall be one piece molded construction composed of fiberglass reinforcement and resin. Resin shall be Type I Isophthalic Polyester, industrial grade corrosion resistance and fire retardant. Fiberglass grating shall be Class 1, with a flame spread rating of 25 or less as tested in accordance with ASTM Designation: E-84 Tunnel Test. Color shall be light gray.

Grating shall have a minimum thickness of 1” and a 1 ½”x1 ½” square mesh pattern providing bidirectional strength. Grating shall be reinforced with continuous rovings of equal number of layers in

each direction. The top layer of reinforcement shall be no more than 1/8-inch below the top surface of the grating so as to provide maximum stiffness and prevent resin from chipping of unreinforced surfaces.

After molding, no dry glass fibers shall be visible on any surface of bearing bars or cross bars. All bars shall be smooth and uniform with no evidence of fiber orientation irregularities, interlaminar voids, porosity, resin rich or resin starved areas. Grating bar intersections are to be filleted to a minimum radius of 1/16" to eliminate stress concentrations and the possibility of resin cracking at these locations.

Grating manufacturer shall be certified in accordance with the ISO 9002 manufacturing process.

GRATING SUPPORTS AND HARDWARE

The grating steel supports, including bolts, nuts, support anchors, and other connecting hardware shall conform to the provisions in Sections 75-1.02, "Miscellaneous Iron and Steel," and 75-1.05, "Galvanizing," of the Standard Specifications.

Steel hold-down and connector clips shall be Type 316 Stainless Steel. Clips shall be specially designed to secure the grating panels to the grating supports and for joining side bars of panels that are butted end to end.

75-1.03J(5) Construction

Grating support system shall be secured to the girder with anchor bolts as shown on the plans.

The Contractor shall provide and verify measurements in the field for work fabricated to fit field conditions as required by grating manufacturer to complete the work.

Gratings shall be installed and fastened to the supports in accordance with the grating manufacturer's recommendation. Field cutting of fiberglass reinforced plastic grating shall be done by using carbide or diamond tipped blades approved by the manufacturer. All cuts or sanded surfaces shall be sealed with resin of the type recommended by the manufacturer.

FRP gratings shall be installed and jointed in conformance with the manufacturer's recommendations.

FRP gratings shall be installed to the lines and grades with sections closely jointed and secured to ensure that no separation of the FRP gratings once they are secured in place.

75-1.03J(6) Payment

Payment for furnishing and installing Fiberglass reinforced plastic (FRP) gratings as described in included in the payment for structural concrete, bridge.

^^

77 LOCAL INFRASTRUCTURE

77 LOCAL INFRASTRUCTURE

77-1.01A SUMMARY

Section 77-1 includes general specifications for furnishing and installing Eastern Municipal Water District (EMWD) water line at Warm Springs Creek, consisting of a potable water line and casings, pipe supports and hangers, joints and associated items as shown on the plans and in conformance with these Special Provisions. The specifications shown as Appendix D "**CLINTON KEITH ROAD EXTENSION WARM SPRINGS CREEK BRIDGE 14" WATER PIPELINE IMPROVEMENTS**" shall govern for all EMWD water line work as shown on the plans. Specifications shown in Appendix D shall be used for the EMWD work only. Specifications shown for the EMWD water line do not apply to other work covered in the standard specifications and these special provisions.

77-1.01B ORDER OF WORK

The Contractor shall follow the sequence of operations as set forth therein for EMWD water line work.

Full compensation for conforming to these requirements will be considered as included in the lump sum price paid for the work and no additional compensation will be allowed therefor.

Submit calculations of effective Projected Area (EPA) and weight of the solar lighting system, and EPA rating of the pole.

Submit information for days of the battery back-up be based on an assumption of no sun and battery cycle life taking into account temperature impact on cycle life.

Submit PV sizing based on worst-case average insolation data from an accredited source (e.g. NREL TMY2), with an additional safety factor to account for worst-case conditions. Consideration given for temperature, PV obstruction and other obstructions.

Submit a series of photograph for the lighting systems.

Wiring diagrams.

Installation instructions.

78-1.01C QUALITY CONTROL AND ASSURANCE

Manufacturer of solar lighting system must be registered to ISO 9001:2008 Quality Standards.

Manufacturer shall possess a minimum of 20 years' experience in manufacturing solar powered lighting systems.

78-1.01C(2) Warranty

Provide manufacturer's warranty covering 5 years on solar lighting system from date of purchase.

Solar Voltaic Panel covered for 20 years.

Mounting hardware, arms & brackets covered for a minimum of 20 years.

Pole and associated components covered by original manufacturer's warranties.

LED light engine, lamps and fixtures covered for a minimum of 10 years.

Wire harnessing, connectors and terminals covered for a minimum of 10 years.

Electronics: LED driver, charge controller, communications covered for a minimum of 10 years.

Batteries have a limited warranty with a replacement cost credit for up to 5 years with the following minimum coverage: 100% credit for the first 2 years, 60% credit for year 3, 40% coverage for year 2 and 20% credit for year 5.

78-1.02 MATERIALS

78-1.02A Manufacturer

The solar lighting system must be a solar lighting system manufactured by Sepco Solar Electric Power Co, or approved equal. Sepco Solar Electric Power Co. is located in Stuart, Florida, and must include items detailed for solar lighting system shown on the plans. The Sepco solar lighting system can be obtained from the distributor, OCS Lighting and Control, Inc. 5797 Chesapeake Ct., Suite 200, San Diego, CA 92123, telephone (858) 514-4000

78-1.02B General

Solar Powered Light System consists of eight (8) components and assemblies: (1) Photovoltaic (PV) Module(s) and mounting structure, (2) Charge Controller/LED Driver, (3) LED Luminaire, (4) Battery(ies), (5) Battery Enclosure, (6) Quick Connect Wire Harnessing with Fuse, (7) Pole and (8) Arm.

1. Photovoltaic (PV) Module

a) Construction:

- 1) Crystalline silicon solar cells
- 2) Framed in an all-aluminum structure
- 3) Sealed behind UV stabilized tempered glass
- 4) Covered by a 20 year power warranty
- 5) RoHS compliant

- 6) Harnessing and cabling is 12 AWG THHN stranded wire with over molded insulation with UV stabilized polymer rated for exterior usage
- 7) Photo Voltaic Panel rated to withstand AASHTO 150 mph wind force ratings.
- 8) Supplemental PV 1/8" aluminum panel pan backer color matched to solar light system
- 9) Water-tight wire junction box on PV module

b) Performance:

- 1) PV generates adequate power to fully recharge system batteries within three (3) days at the installation location given that minimum insolation is available on those days as defined by NREL (National Renewable Energy Laboratories).
- 2) PV electrical junction box and connectors (MC4 type) are sealed per IP 65.
- 3) PV is fastened to support system.

2. Charge Controller/LED Driver

a) Construction:

- 1) Enclosed within the light system with touch-proof covers to prevent damage
- 2) Fully resin potted design and suitable for wet locations.
- 3) The device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.
- 4) Approved by a Nationally Recognized Testing Laboratory - TÜV listed to UL 60950-
- 5) 1:2007 and CSA C22.2.60950-1:2007.
- 6) Charge controller/ LED driver is designed without electrolytic capacitors.
- 7) All other capacitor devices are de-rated by at least 20° C below the capacitor's maximum temperature rating under fully-loaded conditions and ambient temperature of 30° C.
- 8) LED driver must be integrated with the solar charge controller as one unit.
- 9) Charge controller/ LED driver must be capable of controlling and dimming one or two outdoor LED light systems.
- 10) Complies with FCC part 15 noise threshold requirements
- 11) Ten day/night memory averaging to ensure accurate turn on and turn off lights to prevent false response due to weather variations.
- 12) Over Voltage Protection.
- 13) LED Short Circuit Protection.
- 14) Internal PV Disconnect (no external Diodes required).
- 15) Test button and diagnostic LEDs.
- 16) Self Test mode.
- 17) Reverse battery polarity protection.
- 18) Self calibrating load, timing, and charging circuitry.
- 19) Minimum 10 year operational life when operating at minimum or maximum rated system environmental specifications (10° C to 50° C at 0 – 100% relative humidity, non-condensing).
- 20) Designed and tested to withstand electrostatic discharges up to 15,000 V without impairment per IEC 801-2.
- 21) Withstand up to a 6,000 Volt surge without impairment of performance as defined by ANSI C62.41 Category A.
- 22) Manufactured in a facility that employ ESD reduction practices in compliance with ANSI/ESD S20.20.
- 23) Connects to all system components via a quick-connect – latching connector.

b) Performance

- 1) Operates in the following mode:
 - a) Dusk to Dawn
 - b) Programmed Run – Light operates dawn to dusk

- 2) Perform Power Management to increase a system's run-time even with inclement weather conditions.
- 3) Charge Controller operates with temperature compensated limits ensuring battery charging algorithm protects battery (ies) from over and under voltage stress
 - a) Charge controller adapts maximum (charged) voltage based on temperature (14V maximum at 21° C).
 - b) Charge controller prevents discharge below temperature compensated battery Low Voltage Disconnect (LVD) limit (11.5V at 21° C)
- 4) Operate the light for a minimum of at least six (6) nights without adequate insolation during the day to charge the batteries.
- 5) Charge controller never discharges more than 20% depth of discharge per night.
- 6) Charge Controller differentiates between actual sunlight and solar panel illumination from the system's own LED light.

3. LED Luminaire

a) Construction:

- 1) Cobrahead style mounted on pole. Endura fixtures for Wildlife Overcrossing.
- 2) UV stabilized powder coated.
- 3) IP 65 sealed and rain-proof LED chamber.
- 4) Wet location listed.
- 5) Tilt from 0 to 15 degrees above horizontal for better light dispersion
- 6) Designed and factory-installed LED light source only.

b) Performance:

- 1) LED source designed for 65,000 hour performance with over 70% initial lumen maintenance.
- 2) LED chamber of the luminaire provides IP65 protection.
- 3) Use of reflectors or lenses to produce high efficacy lighting patterns.
- 4) Available in Type II, or Type V photometric distribution.
- 5) Pole spacing as shown on plans
- 6) Luminaire shall operate at range of 30 to 45VDC (varies with driver).
- 7) LED junction temperature does not exceed 100 °C in worst-case site temperature conditions
- 8) High brightness LEDs only rated at a typical minimum of 85 lumens/watt by manufacturer). 5 mm type LEDs are not acceptable.
- 9) Bright white LEDs with a color temperature no greater than 5100K or less than 3,500K.
- 10) Manufacturer provides relevant .IES files to indicate light dispersion and intensity of LED source.
- 11) IES file is measured using the IESNA LM-79 testing method for LED luminaires by a laboratory approved by the US DOE's CALiPER program. Scaled photometric testing files are not acceptable.
- 12) Option to add motion detector to adjust lighting between peak and off peak levels for defined periods of time.
- 13) Integrated luminaire shield mounting bosses for house, left and right side, and front side shields.

4. Batteries

a) Construction:

- 1) Sealed valve regulated Gel cell type.
- 2) Maintenance free.
- 3) Air shippable.
- 4) Battery shall be rated "non-spillable" by ICAO/IATA/DOT.
- 5) 100% recyclable.
- 6) Battery must be built to comply with IEC 896-2, DIN 43534, BS 6290 Pt4, and Eurobat.

b) Performance

- 1) Capable of over 2000 cycles.
- 2) Deep cycle technology.
- 3) Maintains over 80% of charge after 2 months if left disconnected.
- 4) Batteries should provide no less than 6 days of back up in no-sun conditions.
- 5) Warranted for a minimum of two (2) years, and an additional pro-rated warranty to cover five (5) years.

5. Battery Enclosure

a) Construction:

- 1) All aluminum vented enclosure.
- 2) Aluminum doors and body powder coated to match the system color.
- 3) Installed below the solar panels on the panel support structure with a minimum 4" of air-barrier to prevent overheating.
- 4) NEMA 3R rated.
- 5) Holds up to 4 large-size (250 Ah) batteries.
- 6) All battery wire terminals and harnessing connect via quick-connect type with keyed connections to prevent miswiring.
- 7) Most feature hinged front cover and optional additional locking device.

b) Performance:

- 1) Access provided for battery service via two (2) bolts for hinged covers or four (2) bolts for non-hinged covers.
- 2) Wire harness is 12AWG THHN wire and finished to prevent accidental shorts.
- 3) Terminal covers, ring washers, terminals, etc. are non-corrosive non-rusting.

6. Wire Harnessing & Fuse

a) Wire Harnesses Construction

- 1) All UV stabilized jacketed wiring and connectors.
- 2) Quick disconnect connector plugs have latch to ensure secure connection.
- 3) Provided with in-line fuse and holder in water tight enclosures.
- 4) Provided in variable lengths to eliminate all field wiring.
- 5) Color coded connectors make circuit purpose identification simple.
- 6) Individually matched quick disconnect plugs for battery, PV and luminaire to charge controller/LED driver.

b) Wire Harness Performance:

- 1) Sealed gasketed connectors prevent dust intrusion IP 66.
- 2) All wire gauges exceed NEC 2009 wire gauge and maximum current draw by 25%.

7. Solar Lighting Pole, PV Structure

a) Pole Construction:

- 1) All aluminum extruded 8" diameter pole with integrated installation channels with bolt down base.
- 2) Captured bolt-head pole design eliminates pole through-drilling for luminaire mounting.
- 3) Stainless steel or zinc plated steel hardware for rust-proof and corrosion resistant mounting equipment.
- 4) Factory supplied with powder coating to match luminaire and battery enclosure precisely.
- 5) Provided with 3.5" aluminum alloy tenon to support direct mounting of the PV array and battery box.
- 6) Pole meets ANSI C136.36A-2010, for Roadway and Area Lighting Equipment- Aluminum Lighting Poles.

b) Pole Performance AASHTO (150 mph wind zone):

- 1) Maximum EPA of 13 square feet (20 foot pole).

- 2) Maximum Weight of 190 lbs (incl. base and tenon) and 500 lbs (entire solar light system).
- 3) Independently verified pole strength and base details by licensed Professional Engineer and Test Lab.
- c) PV Support Structure Construction
 - 1) Extruded high strength Aluminum alloy body.
 - 2) Powder coated to match the battery box and luminaire color.
- d) PV Support Structure Performance:
 - 1) Supports up to 3 PV modules for up to 150mph wind zone.
 - 2) Top of Pole mount provides selectable tilt options of 5, 15, 30, 45, and 60 degrees.
 - 3) Side of Pole mount provides selectable tilt options of 15 and 45 degrees.

8. Arm Structure

- a) Arm Construction:
 - 1) 2" schedule 40 6063-T6 square aluminum tube with extruded aluminum channel.
 - 2) Satin finish.
 - 3) "A" Rated for corrosion resistance.
 - 4) Universal arm manufactured to "ANSI C136.1"
- b) Performance:
 - 1) Mounts directly to pole via two (2) thru bolts.

78-1.03 Construction

Manufacturer offers and provides pre-installation site survey to certify the proposed system locations and/or provide design assistance for locating systems for photometrics and insolation.

Manufacturer offers and provides factory-certified field service engineer to a site visit to ensure proper installation and operation under following parameters:

1. Qualifications for factory-certified field service engineer:
 - a) Minimum experience of 2 years training in the electrical/electronic field.
 - b) Certified by the equipment manufacturer on the system installed.
2. Make a visit upon completion of installation to:
 - a) Verify connection of system components
 - b) Validate performance
 - c) Train Department's representative on system operation and support
3. Battery Storage and Shipping
 - a) Battery(ies) approved for shipping via ground, air, or sea.
 - b) Battery(ies) retains 80% charge or higher from 2 months of shipment.
 - c) Battery(ies) ship sufficiently charged to operate the light 2 nights without any solar charging.
 - d) If storing batteries for future installation: must be stored inside above ground level or covered with tarp or other material to prevent weather damage.

The Contractor shall provide and verify measurements in the field for work fabricated to fit field conditions as required by grating manufacturer to complete the work.

Install equipment in accordance with manufacturer's installation instructions.

Provide complete installation of system in accordance with Contract Documents.

78-1.04 Payment

Full compensation for furnishing and installing Solar Lighting System, including all incidental tools and materials, shipping, handling of poles, lighting equipment, conduit work, and electrical work shall be

Swinging panels shall be fabricated from commercial quality clear Lexan Plastic (Polycarbonate Resin Thermoplastic) material conforming to the dimensions shown on the plans.

The finished surfaces of all components in the one way access opening and associated connections shall be smooth without any sharp or square edges.

Concrete pad for one way access opening shall be minor concrete and shall conform to the provisions in Section 73, "Concrete Curbs and Sidewalks," of the Standard Specifications.

Sign panel shall conform to the provisions in Section 56, "Signs," of the Standard Specifications.

80-4.03 CONSTRUCTION

One way access openings shall be installed at the locations shown on the plans and to the lines and grades established by the Engineer. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the grated line drain.

80-4.04 Payment:

One way access opening payment quantity is the quantity of access opening units, including fabricating and installing the sign.

Add between 11th and 12th paragraph of section 80-10.02:

Fabric for gates in wire mesh fence (Type CL-6, 3/8" x 3/8" MESH) must comply with the specifications for chain link fence (Type CL-6, 3/8" x 3/8" MESH) in section 80-3.

Add to section 80-10.01B:

Gate unit for Tubular steel gate: 1 gate with fittings, hardware, gate and latch posts, concrete footings, braces, and padlock.

Add to section 80-10.02:

Signs for tubular steel gate must comply with Section 56 "Signs" of the standard specifications.

Tubular gate mounting and latching hardware shall not contain open-end slots for the fastening bolts.

Concrete for tubular gate post foundation and post concrete fill shall be minor concrete.

Concrete for wrought iron fence and gate post foundation and post concrete fill shall be minor concrete.

Contractor is advised that wrought iron fence work is applicable only if the 4-Lane option is selected for award.

Add as section 80-10.02(A):

80-10.02(A) WROUGHT IRON FENCE

Steel and Iron: Provide steel and iron in form indicated to comply with the following requirements:

Steel Plate, Shapes, and Bars: ASTM A 36/A 36M.

Steel Sheet: Commercial-quality, cold-rolled, stretcher-leveled, carbon-steel sheet complying with ASTM A 366/A 366M, Class I, matte finish.

Gray-Iron Castings: ASTM A 48, Class 30 (ASTM A 48M, Class 200).

Malleable-Iron Castings: ASTM A 47 (ASTM A 47M), grade as recommended by fabricator for type of use indicated.

Ductile Iron Castings: ASTM A 536, grade as recommended by fabricator for type of use indicated.

Stainless Steel:

Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.

Bars and Shapes: ASTM A 276, Type 304.

Fasteners: Type 304 stainless-steel. Select fasteners for type, grade, and class required.

Exterior Erosion-Resistant Anchoring Cement: Super Por-Rok by Minwax Construction Products, Montvale, NJ.

Paint:

Primer: Intertuf (modified epoxy, high build, high solids) primer by International Coatings Ltd.

Topcoat: Interthane 990HS (polyurethane) by International Coatings Ltd.

Fence Height:] [As indicated on Drawings].

Pickets: Solid 5/8 inch square pickets with either forged or cast iron finials.

Finial: [Type F 1, Square]

Rails: Steel channels, 3/4 inch by 1-1/2 inch by 1/8 inch thick.

Posts: Square steel tubes, 2 inches by 2 inches by 3/16 inch thick, with cast iron post caps.

Post Caps: [Type C-2, Ball]

Add to section 80-10.03:

Welding required in the fabrication of gate members must comply with Section 55-1.02B(7) "Welding," of the standard specifications.

Submit product data in the form of manufacturer's technical data, specifications, and installation instructions for fences and gates.

Shop Drawings: Submit shop drawings showing location of fence and gates, including each post, details of post installation, hardware, and accessories. Show sizes and thicknesses of all members, types of materials, methods of connection and assembly, complete dimensions, clearances, anchorage, relationship to surrounding work, and other pertinent details of fabrication and installation.

Samples for Verification: Submit samples for each profile and pattern of fabricated metal and for each type of metal finish required, prepared on metal of same thickness and alloy indicated for the Work. Include samples of the following:

Post cap including 12 inch (300-mm) long section of post.

Full-size sample of fence, 2 feet wide by full height.

Gate hardware including hinges and latch.

Qualification Data: Submit qualification data for fabricator.

Gates and gate posts for tubular steel gate shall be painted with 2 coats of rust preventive gloss safety yellow, SKU No. 01-0597101, or approved equal.

At SCE gate locations, install a padlock after constructing the gate. SCE will supply the padlock upon gate construction. SCE contract information is shown below.

SCE:

1) Jennifer Ward, ---- (Transmission & Distribution)

Tel.: 714-973-5418 (Office), 714-269-7172 (Cell)

Add as section 80-10.03(A):

80-10.02(A) CONSTRUCTION OF WROUGHT IRON FENCE

Shop Assembly: Preassemble fence in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

Attach cast iron picket finials and post caps with stainless steel set screws after painting and finishing of pickets, posts, finials, and caps. Welding of finials to pickets and caps to posts will not be accepted.

Straighten pickets. Maximum deviation from straight shall be 1/8 inch in 4 feet.

Shear and punch metals cleanly and accurately. Remove burrs.

Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

All forging shall be coal forged.

Provide castings that are sound and free of warp or defects which impair strength or appearance.

Weld pickets to rails and weld brackets to posts. Make all welds continuous, to comply with the following:

Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

Obtain fusion without undercut or overlap.

At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fence rigidly in place.

Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

FINISHES, GENERAL

Comply with National Association of Architectural Metal Manufacturers (NAAMM) "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

Finish ornamental metal fences and gates after assembly.

STEEL AND IRON FINISHES

Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below and SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning" for surface preparation specifications and environmental exposure conditions of installed metal fabrications:

Remove all loose scale by blasting in accordance with SSPC-SP6. Perform blasting with an air compressor having a minimum capacity of 200 C.F.M. and an air dryer with a minimum capacity of 250 C.F.M.. Use cast steel grit blast media G25, G40, or G50 in accordance with SAE J1993.

Apply coating system within four hours of blasting, in a suitably designed spray booth capable of controlling environmental conditions. Do not apply paint when the air, steel or paint materials are below 50 degrees F. or the humidity is above 80 percent.

Do not apply paint when the relative humidity exceeds 80 percent or when the temperature is less than 5 degrees above the dew point. The temperature of the material to be coated must be within 5 degrees of the ambient temperature with minimum material temperature to be above 50 degrees. Monitor and record temperature and relative humidity on a daily basis during each application.

Shop Priming: Shop apply epoxy primer, within four hours of blasting, to uncoated surfaces of metal at 4.0 to 6.0 mils DFT. Comply with SSPC PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

DIVISION IX TRAFFIC CONTROL FACILITIES

AA

83 RAILINGS AND BARRIERS

Add to the section 83-1.02G(2):

The exterior finish of railing components on both bridges shall be black conforming to ASTM F934 and metal shall be polyvinyl chloride (PVC) coated, 40 mils nominal thickness, conforming to the requirements in Federal Specification RR-F-19. The strength of the bond between the coating material and steel of the metal railing shall be equal to or greater than the cohesive strength of the polyvinyl chloride (PVC) coating material.

The Contractor shall submit complete shop drawings for each railing panel (unit between pilasters) to the Engineer in conformance with the provisions in Section 5-1.02, "Contract Components," of the Standard Specifications. The shop drawings shall show complete details of the railing assembly and anchorage components and the method of installation to be followed, including concrete blockout details for post pockets and additions or rearrangements of the reinforcing steel from that shown on the plans. For initial review, 5 sets of shop drawings shall be submitted. After review, between 6 and 12 sets of shop drawings, as requested by the Engineer, shall be submitted for final approval and use during construction.

Each shipment of railing materials shall be accompanied by a Certificate of Compliance in conformance with the provisions in Section 6-3.05E, "Certificates of Compliance," of the Standard Specifications. The certificate shall state that the materials and fabrication involved comply in all respects to the specifications and data submitted in obtaining the approval.

Add section 83-2.02D(6):

83-2.02D(6) Skate Board Deterrent

Skate board deterrent must be furnished and installed as shown on the plans and under these special provisions.

The allowable alternatives for a skateboard deterrent system must consist of the following or a Department-authorized equal.

1. GrinderMinder – Skate Board Deterrent system must be a ball and stud manufactured by Grind To A Halt Inc., located in Elburn, Illinois, and must include items detailed for skateboard deterrent system shown on the plans. The GrinderMinder can be obtained from the manufacturer, Grind To A Halt, Inc., P.O. Box 221, Elburn, IL 60119, telephone (630) 365–2375
2. SBDSPPHERE- Skate Board Deterrent system must be a ball and stud manufactured by Traffic Safety Systems Pty Ltd., located in Dee Why NSW, Australia, and must include items detailed for skateboard deterrent system shown on the plans. The SBDSPPHERE can be obtained from the manufacturer, Traffic Safety Systems Pty Ltd., P.O. Box 525, Dee Why NSW, Australia 2099, website: www.trafficsafety.com.au

Skateboard deterrent systems must be installed under the manufacturer's installation instructions and these specifications.

Prior to installation ensure hole is free of any dust, grease or water.

After installing the skate board deterrent, clean excess adhesive in a uniform manner along the barrier where designated by the Engineer.

Full compensation for furnishing and installing skateboard deterrent shall be considered as included in the price paid for the concrete barrier involved, and no additional compensation will be allowed therefor.

500 mcd/sq m/lx for yellow stripes and markings. Test the retroreflectivity using a reflectometer under ASTM E 1710.

84-6.02 MATERIALS

Thermoplastic traffic stripes and pavement markings with enhanced wet-night visibility must consist of a single uniform layer of thermoplastic and 2 layers of glass beads as follows:

1. The 1st layer of glass beads must be on the Authorized Material List under high-performance retroreflective glass beads for use in thermoplastic traffic stripes and pavement markings. The color of the glass beads must match the color of the stripe or marking to which they are being applied.
2. The 2nd layer of glass beads must comply with AASHTO M 247, Type 2.

Both types of glass beads must be surface treated for use with thermoplastic under the bead manufacturer's instructions.

84-6.03 CONSTRUCTION

Use a ribbon-extrusion or screed-type applicator to apply thermoplastic traffic stripe.

Operate the striping machine at a speed of 8 mph or slower during the application of thermoplastic traffic stripe and glass beads.

Apply thermoplastic traffic stripe at a rate of at least 0.38 lb/ft of 4-inch-wide solid stripe. The applied thermoplastic traffic stripe must be at least 0.090 inch thick.

Apply thermoplastic pavement marking at a rate of at least 1.06 lb/sq ft. The applied thermoplastic pavement marking must be at least 0.100 inch thick.

Apply thermoplastic traffic stripe and both types of glass beads in a single pass. First apply the thermoplastic, followed immediately by consecutive applications of high-performance glass beads and then AASHTO M 247, Type 2, glass beads. Use a separate applicator gun for each type of glass bead.

You may apply glass beads by hand on pavement markings.

Distribute glass beads uniformly on traffic stripes and pavement markings. Apply high-performance glass beads at a rate of at least 6 lb/100 sq ft of stripe or marking. Apply AASHTO M 247, Type 2, glass beads at a rate of at least 8 lb/100 sq ft of stripe or marking. The combined weight of the 2 types of glass beads must be greater than 14 lb/100 sq ft of stripe or marking.

84-6.04 PAYMENT

Not Used

AA

86 ELECTRICAL SYSTEMS

Add to section 86-1:

COUNTY - TRAFFIC SIGNAL AND HIGHWAY LIGHTING SYSTEM

A. General

Furnishing and installing traffic signal and highway lighting systems, and payment shall conform to the provisions in Section 86, "Electrical Systems", of the latest edition Standard Specifications, amendments to the Standard Specifications, and these Special Provisions.

B. Start of Work

Location where signalization and highway lighting work is to be performed:

	Location	Area
1.	Clinton Keith Road and Trois Valley Street	French Valley Area
2.	Clinton Keith Road and Menifee Road ***	City of Murrieta
3.	Clinton Keith Road and Whitewood Road	City of Murrieta

*** Note: Location No. 2 (Clinton Keith Road and Menifee Road) is applicable only if the 4-Lane option is selected for award.

Traffic signals on Locations 2 and 3 are within the City of Murrieta boundaries; therefore, work on these two locations shall conform to the provisions found in Section 86-B ELECTRICAL SYSTEMS, CITY OF MURRIETA - TRAFFIC SIGNAL AND HIGHWAY LIGHTING SYSTEM (page 147-168) of these special provisions.

C. Equipment Orders

The Contractor shall furnish all equipments and materials specified in the plans and these special provisions that are not furnished by the County. All equipment shall be new and purchased by the Contractor for this project only.

Submittals and issuance of Notice to Proceed

Within twenty one (21) calendar days after the award of the contract, the Contractor shall submit equipment and materials submittals to the Engineer for review and approval. The Contractor shall allow fourteen (14) calendar days for the Engineer to review the equipment and materials submittals. If revisions are required as determined by the Engineer, the Contractor shall revise and resubmit the equipment and materials submittals within seven (7) calendar days of receipt of the Engineer's comments and shall allow seven (7) working days for the Engineer to review the revisions. Once the submittals are approved by the Engineer, the Contractor must order equipment and materials and then submit a copy of each vendor Equipment and Material Purchase Order within (7) calendar days to the Engineer.

The Contractor must have copies of approved Equipment and Material submittal(s) and Purchase Order(s) prior to the coordination and issuance of the Notice to Proceed. Delay in equipment delivery shall not be considered as justification for the suspension of the construction contract.

Additional Liquidated Damages

In addition to the liquidated damages set forth in Special Provision section "Liquidated Damages" of these contract documents, the Contractor shall pay to the County of Riverside the sum of \$800.00 per day for each and every calendar day delay in receiving all of the below listed equipment furnished by the Contractor, onto the job site or the Contractor's storage facility, and available for installation, within sixty (60) calendar days of the contract award date:

1. Traffic Signal and Pedestrian Signal heads
2. Service Equipment Enclosures
3. Traffic Signal and Pedestrian Signal heads
4. LED Modules
5. Edge Lit LED Internally Illuminated Street Name Signs and mounting brackets
6. Video Detection Equipment

D. Equipment List and Drawings

Equipment list and drawings shall conform to the provisions in Section 86-1.04, "Equipment List and Drawings", of the Standard Specifications and these Special Provisions.

The Contractor shall furnish four complete cabinet wiring diagrams for each furnished controller assembly, battery backup system, video detection system, and emergency vehicle preemption system. The cabinet wiring diagram shall include an approximately 6 inches x 8 inches or larger schematic drawing of the project intersection on a separate 8 ½" x 11" sheet of paper, which shall include the following information, at a minimum:

1. North arrow
2. Street names
3. Pavement delineation and markings
4. Signal poles
5. Traffic signal heads with phase designations
6. Pedestrian signal heads with phase designations
7. Loop detectors with input file designations

E. Warranties, Guaranties, Instruction Sheets, and Manuals

Warranties, guaranties and instruction sheets shall conform to these Special Provisions.

1. LED modules shall have five (5) years of manufacturer warranty.
2. Battery Backup System (BBS) shall have five (5) years of manufacturer warranty. The first three (3) years shall be termed the "Advanced Replacement Program". Under this program, the manufacturer will send out a replacement within two business days of the call notifying them of an issue. The replacement unit may be either a new unit or a re-manufactured unit that is up to the latest revision. The last two years of the warranty will be factory-repair warranty for parts and labor on the BBS.
3. Video Detection System shall have three (3) years of manufacturer warranty. During the warranty period, technical support from factory-certified personnel or factory-certified installers shall be available via telephone within four (4) hours of the time when a service call is made.
4. Edge Lit LED internally illuminated street name sign shall have two (2) year of manufacturer warranty.
5. All other equipment and systems shall have at least one (1) year of manufacturer warranty.

Furnish the manufacturer's standard written warranty pertaining to defects in materials and workmanship for all equipment, and two (2) sets of user, operation, and maintenance manuals, written in English, on all equipments and components for the traffic signal and highway lighting system to the Engineer.

F. 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.

Authorization and coordination from the Engineer is required for each traffic signal system shutdown. 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.

Equip existing flashing beacons with portable flashing beacons during flashing beacon shutdown. Portable flashing beacons shall conform to the provisions in Section 12-3.05, "Portable Flashing Beacons" of the Standard Specifications or as directed by the Engineer.

If directed by the Engineer, a generator shall be furnished, connected, and maintained to keep traffic signal or flashing beacon system running in normal operation. All matters pertaining to the operation of existing traffic signal equipment shall be coordinated and cooperated with Riverside County's traffic signal operation division.

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.

G. Remove, Reinstalling or Salvaging Electrical Equipment

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

H. Foundations

Foundations shall conform to the provisions in Section 51, "Concrete Structures", and Section 86-2.03, "Foundations", of the Standard Specifications and these Special Provisions.

Portland cement concrete shall conform to Section 90-2, "Minor Concrete", of the Standard Specifications and shall be Class 3 except pole foundations shall be Class 2.

Construct Type 332 controller cabinet foundation per Standard Plans ES-3C.

Vibrate all foundation concrete to eliminate air pockets.

I. Standards, Poles, Steel Pedestals and Posts

Standards, poles, steel pedestals, and posts shall conform to the provisions in Section 86-2.04, "Standards, Poles, Steel Pedestals and Posts", of the Standard Specifications and these Special Provisions.

Type 1A pole material shall be spun aluminum unless otherwise specified.

Poles installed at the near-right approach of each intersection shall be banded conforming to the strap and saddle method per Standard Plans RS4 for the emergency installation of stop signs.

Signal mast arms shall be installed in accordance with the "Signal Arm Connection Details" of the Standard Plans unless otherwise specified.

Internally Illuminated Street Name Sign (IISNS) mast arm shall be 10-foot long galvanized steel pole in accordance with County Standard No. 1200. The IISNS mast arm shall be constructed to prevent deformation or failure when subjected to 100 mph wind loads while carrying a 10' long and 2' height Edge-Lit LED IISNS.

If required by the serving electric utility, and confirmed by the Engineer, State Certified Electric Workers shall be utilized for the installation of standards, steel pedestals, and posts in accordance with State of California High Voltage Safety Orders.

J. Conduits

Conduit shall conform to the provisions in Section 86-2.05, "Conduit", of the Standard Specifications and these Special Provisions.

Conduits shall be Type 3, Schedule 80 Polyvinyl Chloride (PVC) conforming to UL Publication 651 requirements for Rigid Non-Metallic Conduit, for underground installation only.

Conduit depth shall not exceed 60 inches below finish grade.

Conduit size shall be 2 inches minimum unless otherwise specified. New conduit shall not pass through foundations or standards.

Conduit bends shall be factory bends. Bend radius for signal interconnect conduits shall be 3 feet minimum.

A pull rope and a bare #12 AWG wire shall be installed in conduits intended for future use.

Bell bushings are required for all conduit ends. The ends of conduits terminating in pull boxes and controller cabinets shall be sealed with sealing compound approved by the Engineer after conductors have been installed.

Conduits shall be installed via jacking or drilling method per Section 86-2.05C, "Installation", of the Standard Specifications.

Trenching Installation

The Engineer shall approve trenching installation on a case-by-case basis where conduit cannot be installed by jacking or drilling. Jacking or Drilling shall be attempted a minimum of three times prior to requesting trenching installation.

If ordered by the Engineer, all pavements shall be cut to a depth of 3 inches with an abrasive type saw or with a rock cutting excavator specifically designed for this purpose. Cuts shall be neat and true with no shatter surface outside the removal area.

Trench shall be 2 inches wider than the outside diameter of the conduit being installed however not exceeding 6 inches in total width. The conduit shall be placed in the bottom of the trench. Conduit depth shall be at a minimum of 30 inches below finished grade, with a minimum of 26 inches cover over the conduit.

The trench shall be backfilled with two-sack slurry to the finish grade before final paving. Prior to final paving, grind pavement centered along the length of the trench a minimum width of 3 feet and depth

of 0.10 feet, and excavate backfilled to a depth of 0.30 feet below the final pavement surface. Final paving with commercial Type A ½" PG64-10 asphalt concrete.

If directed by the Engineer, the two-sack slurry backfill can be installed to a depth of 0.30 feet below the final pavement surface and cured for a minimum of two days prior to final paving if the trench area is not open to traffic.

K. 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 86-2.06, "Traffic Pull Boxes", of the Standard Specifications and these Special Provisions.

Pull boxes shall have a "Fibrelyte" or equivalent cover and bolt down design. Cover shall have a non-skid surface.

Pull box covers shall be marked in accordance with Standard Plans ES-8 without the word "CALTRANS" unless the project is 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 500 feet intervals. The Engineer shall determine the exact locations.

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

L. Conductors, Cables and Wiring

Conductors and Cables shall conform to the provisions in Section 86-2.08, "Conductors and Cables", of the Standard Specifications and these Special Provisions.

Wiring shall conform to the provisions in Section 86-2.09, "Wiring", of the Standard Specifications and these Special Provisions.

Specific cabling and wiring requirements for various systems or components shall be in accordance with the Special Provisions entitled to each herein.

Signal cable shall be installed continuously without splicing from the controller cabinet to each traffic signal pole. Traffic signal conductors, multiple circuit conductors, and signal cable conductors shall not be spliced unless otherwise shown

All outer cable jacket for 12 conductor cable shall be removed from the traffic signal standard hand hole to the terminal block located at the side mount traffic signal head.

Where splice is required, Type C or Type T splice shall be used and insulated as shown in the Standard Plans, ES-13A.

Where splice is required, "Liquid Electrical Tape" or equivalent in black color shall be used to provide a watertight electrical insulating coating with "Method B" as shown in the Standard Plans, ES-13A.

Minimum luminaire wiring shall be No. 10 AWG, including wiring within poles and mast arms.

M. Singnal Interconnect Cable

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

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

Submit a sample of the proposed SIC to the Engineer for approval prior to installation.

SIC shall be pulled without splices in between traffic signal controller cabinets. Provide 6 feet of slack in each pull box, 20 feet of slack inside the pull box adjacent to the controller cabinet, and 3 feet of slack inside the controller cabinet.

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 Number	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)

N. 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.

Grounding jumper shall be attached by a 3/16 inch or larger brass bolt in the signal standard or controller pedestal and shall be run to the conduit, ground rod or bonding wire in the adjacent pull box.

Grounding jumper shall be visible after cap has been poured on foundation.

For equipment grounding jumper a No. 8 bare copper wire shall run continuously in all circuits except a No. 12 bare copper wire shall run continuously in conduits that contain only signal interconnect cable and/or loop detector cable.

O. Service

Service shall conform to the provisions in Section 86-2.11, "Service", of the Standard Specifications and these Special Provisions.

Service equipment enclosure shall be Type III-CF, as shown on the Standard Plans, ES-2F, and shall conform to the following:

1. 120 / 240 volt, 2 meter service unless otherwise shown on the plans.
2. Circuit breakers required:
 - 2 - 100 Amp 2 pole (signal main and lighting main)
 - 1 - 30 Amp 1 pole (luminaires)
 - 1 - 30 Amp 1 pole (signals)
 - 1 - 20 Amp 1 pole (illuminated street name signs)
 - 1 - 15 Amp 1 pole (luminaire photoelectric control)
 - 1 - 15 Amp 1 pole (street name sign photoelectric control)
3. Cabinet shall be fabricated from aluminum sheeting and finish shall be anodic coating in accordance with Section 86-3.04A "Cabinet Construction".
4. Circuit breakers shall be marked with identifying labels for each circuit breaker.

Type V photoelectric control contactor and test switch assembly shall be installed in the service cabinet. Photoelectric control contactors shall be as follows:

1. Luminaires - 60 Amp electrically held contact
2. Street name signs - 30 Amp electrically held contact

A GFCI outlet shall be installed on the interior side of service cabinet door.

Photo Electric Control assembly shall be installed within the circuit breaker compartment of the service equipment enclosure, and accessible to the Engineer after installation of electrical meters.

Direct burial service conductors are not allowed.

The Contractor shall be responsible for contacting the power company, arranging and providing for the electrical service connection, and ensuring that adequate notice is provided to the serving electric company in advance of need. *The County of Riverside will pay all electric company fees required.*

The service equipment enclosure shall be a minimum of 15 feet from the controller cabinet, and a minimum of 10 feet from all utility poles, unless otherwise directed by the Engineer.

Service Identification

The service address shall be shown on the front upper panel of the service equipment enclosure, and the meters shall be labeled "LS3" (lighting meter) and "TC1" (signal meter) by lettering applied to the exterior of the enclosure in accordance with these special provisions, or as directed by the Engineer.

Lettering markings shall be black with a two-inch minimum size in block letter form. Markings shall be applied to a brushed aluminum, stainless steel, or other non-corroding metallic plate, as approved by the Engineer. Plate shall be white in color. All paint and markings shall conform in all respects to Federal Specification TT-E-489, latest revision, Class A, Air Drying. Said plate shall be affixed in a permanent manner by riveting or with stainless steel bolts and nuts. Bolts shall be peened after tightening. All materials used for affixing address plate shall be non-corroding. The Engineer shall approve all alternate materials and methods prior to installation.

P. Testing

Testing and Field Testing shall conform to the provisions in Section 86-2.14, "Testing", of the Standard Specifications and these Special Provisions.

Specific testing requirements for various systems and components shall be in accordance with the Special Provisions entitled to each herein.

The complete controller assembly and Battery Backup System shall be delivered to the following location or location as directed by the Engineer for testing:

Traffic Signal Shop
Riverside County Transportation Department
McKenzie Highway Operations Center
2950 Washington Street
Riverside, California 92504
Telephone (951) 955-6894

A minimum of 15 working days for operational testing and adjustment is required. An additional 15 working days period shall be allowed for retesting should the equipment fail.

The conflict monitor unit shall be tested in the field before signal turn on.

Q. Controller Assembly

Controller assembly shall conform to the provisions in Section 86-3, "Controller Assemblies", of the Standard Specifications and these Special Provisions.

Controller assembly shall be Model 170 controller assembly consisting of the additional features:

1. Model 332L controller cabinet:
 - Anodic coating for both interior and exterior finish
 - A Corbin No. 2 door lock
2. An interior fluorescent lamp with an on/off switch and a door switch that will automatically turn on the lamp when cabinet door is opened.
3. An interior thermostatically controlled, 110 volt electric fan with ball or roller bearing that has capacity rating of 100 cubic feet per minute minimum.
4. Rack mounted push buttons for manual actuation of the following:
 - 8 vehicular phases,
 - 4 pedestrian phases,
 - 4 Emergency Vehicle Preemption (EVP) phases; and,
 - 2 Railroad preemption phases.
5. Model 170E local controller unit:
 - Dual Asynchronous Communications Interface Adaptor (ACIA) capability. ACIA shall be integral to the controller unit. Horizontal printed circuit board controllers will not be accepted.
 - A Model 412F Program Module with 32K 27256 EPROM, 16K RAM, and 8K zero power RAM (memory method two, memory select four).
 - Bi Trans Systems, Inc. 233RV2.5 or latest version firmware, test program and a loopback cable.
 - If required, provide a Model 170E field master controller unit that has the same features as the 170E local controller except the firmware shall be Bi Tran Systems, Inc. No. 245 FM. It shall be mounted above the local controller unit.

6. A pullout shelf/drawer assembly made of aluminum with telescoping drawer guides for full extension installed below the local controller unit. The top shall have a non-slip plastic laminate permanently attached. The non-slip laminate shall not be attached with silicon adhesive.
7. Load Switches: Switching circuit shall be contained in a replacement module (cube type) sealed in epoxy and rated at 15 amperes load (25 Amp triac). Pin 11 on all load switch sockets shall be wired to AC. Input and output indicators shall be installed on all load switches.

All load switch sockets shall have individual wire terminals. Printed circuit boards will not be allowed.
8. Flasher units: Switching circuit shall be contained in a replacement module (cube type) sealed in epoxy and rated at 15 amperes load (25 Amps triac).
9. Conflict monitor shall be EDI Model 2010ECL or equivalent with a red monitor assembly circuit board and capable of monitoring green, amber and red indications.
10. Loop detector sensor unit shall be Model 222:
 - Detector unit shall have delay timers adjustable from zero to a minimum of 30 seconds and extension timers adjustable from zero to a minimum of 7 seconds.
 - Delay timers shall delay calls only during display of the associated red or yellow indications. If a vehicle departs the area of detection prior to expiration of the assigned delay period, the timer shall reset and no call shall be placed upon the controller. During display of the associated green indication, detectors shall operate in the present mode and calls shall not be delayed.
11. Power Distribution Assembly shall be Model PDA-2.
12. A twelve-position interconnect terminal strip.

The contractor shall furnish the following spare equipments / components:

Description	Model	Quantity
Cabinet	332	0
Controller Unit (local)	170E	0
Controller Unit (master)	170E	0
Switch Pack	200	0
Flasher Unit	204	0
Conflict Monitor Unit	2010	0
2-Channel Loop Detector	222	0
2-Channel DC Isolator	242	0
Modem Module	400	0
Program Module	412F	0
Auxiliary Load Bay	420 Aux Output File	1

Spare equipments or components shall be delivered to the following location or as directed by the Engineer:

Traffic Signal Shop
Riverside County Transportation Department

McKenzie Highway Operations Center
2950 Washington Street
Riverside, California 92504
Telephone (951) 955-6894

The controller unit and controller cabinet shall be manufactured and furnished by the same manufacturer to form a complete functional controller system capable of providing the traffic signal operation specified. All traffic control equipment to be furnished shall be listed on the California Department of Transportation Qualified Products List.

The controller unit and controller cabinet manufacturer or supplier shall perform operational and functional testing of the supplied controller assembly and additional supplied equipment in accordance with the State of California Department of Transportation's Transportation Electrical Equipment specifications (TEES), and a Certificate of Compliance shall be issued for each successfully tested controller assembly and additional supplied equipment.

Modify traffic signal controller assembly if necessary and provide any necessary auxiliary equipment and cabling to achieve the intended traffic signal operation as shown on the plans. The Contractor shall make all field wiring connections to the terminal blocks inside the controller cabinet.

A technician who is qualified to work on the controller assembly from the controller manufacturer or their representative shall install the program module and program the signal controller in accordance with the Engineer provided signal timing sheets, and to be present when the equipment is turned on.

R. Vehicle Signal Assemblies

Vehicle signal assemblies and auxiliary equipment shall conform to the provisions in Section 86-4, "Traffic Signal Faces and Fittings", of the Standard Specifications and these Special Provisions.

Signal sections, backplates, visors and signal mounting assemblies shall be the metal type and shall be made from the same manufacturer. The section assemblies shall be uniform in appearance and alignment.

Backplates shall be louvered. Visors shall be the "tunnel" type. Top opening of signal sections shall be sealed with neoprene gaskets.

Vehicle signal indications shall be 12-inch diameter Light Emitting Diode (LED) modules in accordance with the following:

1. All circular LED modules shall comply with Institute of Transportation Engineers (ITE) Vehicle Traffic Control Signal Heads (VETCH) - LED Circular Supplement, Adopted June 27, 2005.
2. All arrow LED modules shall comply with ITE VETCH - LED Vehicle Arrow Traffic Signal Supplement, Adopted July 1, 2007.
3. All modules shall fit in existing signal housings without the use of special tools.
4. All modules shall be certified in the Intertek LED Traffic Signal Modules Certification Program and be labeled with the ETL Verified Label as follows:



5. Luminous intensity requirements of the VTCSH must be met across the entire temperature range from -40°C to + 74°C, (-40°F to +165°F).
6. The following cable colors shall be used for the AC power leads on all modules: white for common, red for the red module line, yellow for the yellow module line, and brown for the green module line.
7. The AC power leads shall exit the module via a rubber grommet strain relief, and shall be terminated with quick connect terminals with spade tab adapters. The leads shall be separate at the point at which they leave the module.
8. All external wiring used in the module shall be anti-capillary type cable to prevent the wicking of moisture to the interior of the module.
9. All power supplies shall be coated for additional moisture and thermal protection.
10. The module shall have an incandescent, non-pixelated appearance when illuminated.
11. Nominal power usage is measured at 25°C, 120 VAC. For the 8 inch modules, it shall not exceed 8 watts for Red, 10 watts for Yellow, and 8 watts for Green modules. For the 12 inch modules, it shall not exceed 8 watts for Red, 13 watts for Yellow, and 10 watts for Green modules. For the arrows, it shall not exceed 8 watts for Red, 13 watts for Yellow, and 8 watts for Green modules.
12. All modules shall use LEDs that have been manufactured with materials that have industry acceptance as being suitable for uses in outdoor applications. At no time is the use of LEDs that utilize AlGaAs technology acceptable.
13. The external lens shall have a smooth outer surface to prevent the buildup of dirt and dust and shall be designed to minimize the potential for sun phantom signals.
14. The circular LED module lens material must be tinted . A tinted transparent film or coating is not permitted.
15. A module shall be sealed against dust and moisture intrusion, including rain and blowing rain per Mil-Std-810F Method 506.4, Procedure 1.
16. Arrow modules shall be clearly marked with the phrase "Suitable for mounting in any orientation".
17. Modules shall be repaired or replaced if the module fails to function as intended due to workmanship or material defects within warranty period.
18. Modules shall be repaired or replaced if the module exhibit luminous intensities less than the minimum specified values within 60 months of the date of delivery.
19. The Manufacturer shall clearly disclose the country in which the factory of module origin is located, the name of the company or organization that owns the factory including all of its parent companies and/or organizations, and their respective country of corporate citizenship.

S. Pedestrian Signal Assemblies

Pedestrian signals assemblies shall conform to the provisions in Section 86-4.03, "Pedestrian Signal Faces", of the Standard Specifications and these Special Provisions.

Pedestrian Signal Mounting Assemblies and Pedestrian Signal Housings shall be made from the same manufacturer and the section assemblies shall be uniform in appearance and alignment.

Pedestrian signals shall be provided with a polycarbonate egg crate or Z-crate screen.

Pedestrian signals shall be equipped with light emitting diode countdown pedestrian module in accordance to the following:

1. It shall comply with ITE specification: Pedestrian Traffic Control Signal Indications (PTCSI) Part 2: LED Pedestrian Traffic Signal Modules, Adopted March 19, 2004.
2. All modules shall fit in existing signal housings without the use of special tools.
3. All modules shall be certified in the Intertek LED Traffic Signal Modules Certification Program and be labeled with the ETL Verified Label as follows:



The PTCSI does not cover the countdown features of countdown pedestrian signal LED modules. The countdown features shall incorporate the following:

1. Fully compliant to NEMA TS-1, NEMA TS-2, Type 170, and Type 2070 traffic signal controller specifications.
2. The countdown portion of the pedestrian (ped) module shall have a high off-state input impedance so as not to provide a load indication to conflict monitors and interfere with the monitoring of the pedestrian signal. The input impedance of the countdown circuitry shall maintain a voltage reading above 25 VAC to the conflict monitor for up to four units connected on the same channel.
3. The countdown drive circuitry shall not be damaged when subjected to defective load switches providing a half wave signal input.
4. The countdown ped module shall have an internal conflict monitor circuit preventing any possible conflicts between the Hand, Person, and Countdown signal indications. It shall be impossible for the display to countdown during a solid Hand indication.
5. Per CA MUTCD Manual section 4E.07: "The countdown pedestrian signal shall display the number of seconds remaining until the termination of the pedestrian change interval. Countdown displays shall not be used during the walk interval or during the red clearance interval of a concurrent vehicular phase".
6. The countdown ped module shall have a micro-processor capable of recording its own time when connected to a traffic controller. It shall be capable of displaying the digits 0 through 99.
7. When power is first applied or restored to the ped module, the countdown display will be blank during the initial cycle while it records the countdown time using the walk (person) and don't walk (flashing hand) signal indications. The normal hand and person icons shall be displayed during this cycle.
8. The countdown ped module shall continuously monitor the traffic controller for any changes to the pedestrian phase time and re-program itself automatically if needed.
9. The countdown ped module shall register the time for the walk and clearance intervals individually and shall begin counting down at the beginning of the pedestrian clearance interval. The digits shall not flash during the countdown.

10. When the flashing hand becomes solid, the ped module shall display 0 for one second and then blank-out. The display shall remain dark until the beginning of the next countdown.
11. In the event of a pre-emption, the countdown ped module shall skip the remaining time, reach 0 at the same time as the flashing Hand becomes solid, and remain dark until the next cycle.
12. In the cycle following preemption call, the signal shall display the correct time and not be affected by the reduced previous cycle. The countdown shall remain synchronized with the signal indications and always reach 0 at the same time as the flashing Hand becomes solid.
13. If a pedestrian button is activated during the clearance interval, some controllers can change to a second walk cycle without a don't walk phase. The countdown module shall also be capable of consecutive walk cycles. The display digits will be blank during the second walk and countdown properly during the second flashing hand.
14. The countdown ped module shall not display an erroneous or conflicting time when subjected to defective load switches. Should there be a short power interruption during the ped clearance interval or if voltage is applied to both the hand and person simultaneously the display will go to "0" then blank.
15. The countdown ped module shall have accessible dip-switches for the user selectable options. The unit shall have a removable plug on the rear allowing easy access to control the user selectable functions. The countdown is disabled when all the switches are in the "ON" position. The unit shall be shipped from the factory with the specified default setting.
16. Switch 1 – Blank Cycle Following a Timing Change – Factory default is "OFF". When this switch is "OFF" the unit will allow the time to be displayed normally during the cycle following a truncated timing such as a preemption call. The countdown shall be capable of displaying the correct time and not affected by the previous reduced cycle. The unit will require 2 consecutive reduced cycles of identical value to validate and record a new time setting. If the timing is extended, the unit will record it immediately. In the "ON" position when a change in timing is detected the unit will blank out during the following cycle while the new cycle time is measured and recorded if confirmed.
17. Switch 2 – Disables Auto-sync Mode- Factory default setting is "OFF". When this switch is in the "OFF" position the auto-sync is enabled. When the clearance interval begins and the initial flash of the hand is not in sync with the walk signal the unit will measure the offset and reduce the duration of the first second by the value of the offset. This will ensure the countdown reached zero at the same time as the flashing hand becomes solid. In the "ON" position there is no time correction when the flashing hand is in offset with the walk signal. The duration of the first second will not be reduced and the hand will appear solid shortly before the countdown reaches zero.
18. Switch 3 – Countdown Starts with Flashing Hand Signal – Factory default setting is "ON". When this switch is "ON" the countdown begins when the hand signal is turned on. With this switch "ON" and the auto-sync mode enabled a short power interruption will have no effect on the countdown display. With switch 3 in the "OFF" position the countdown begins when the walk signal is turned off. This eliminates the effect of an offset hand signal. When switch 3 is in the "OFF" position the auto-sync switch 2 has no effect on the countdown. In this mode if the power to the walk signal is interrupted, the unit will interpret this as the start of the clearance interval and will display the countdown time for 2 seconds before the operation is cancelled. The countdown will resume with the normal ending of the walk signal.
19. Switch 4 – Stores Time Value in Memory, Immediate. Restart. - Factory default setting is "OFF". When this switch is in the "OFF" position and power is removed from the unit, the time value stored in the unit is erased. The unit will need to run a dark cycle before it can display the countdown again. In the "ON" position the countdown timing is stored in memory. Following a power interruption, the unit will restart with the stored value and not remain dark during the

learning cycle. If the value is different after restart, it will be recorded and displayed correctly at the following cycle.

20. Switch 5 – All LEDs “ON”, Test Mode – Factory default setting is “OFF”. With this switch in the “ON” position all LEDs are turned on simultaneously. With both switches 4 and 5 in the “ON” position the LED test mode will also scan the 7 individual segments of both digits.
21. The countdown shall be disabled when all switches are placed in the “ON” position.
22. Nominal power usage for Ped Modules at 25°C (77°F), 120 VAC input shall not exceed the values shown in Table 1.

Table 1 -- Nominal Power of Pedestrian Signals

Size	Description	Wattage @ 25°C		
		Hand	Person	Countdown ¹
16"x18"	Side by Side Hand & Person	8	7	N/A
16"x18"	Hand & Person Overlay with Countdown	9	9	8

¹ Wattage for the countdown is measured when the digits 18 are displayed.

23. All wiring shall meet the requirements of Section 13.02 of the VTCSH standard. Secured, color coded, 600V, 18 AWG jacketed wires, 1 meter (39 in) in length, conforming to the NFPA 70, National Electrical Code, and rated for service at +105°C, shall be provided.
24. The following color scheme shall be used for the ped module’s AC power leads: Orange for the upraised hand, Blue for the walking person, and White for common. The countdown portion of the LED ped module shall be internally wired to the hand and walking person power.
25. The AC power leads shall exit the ped module via a rubber grommited strain relief, and shall be terminated with insulated female quick connect terminals with spade / tab adapters. The leads shall be separate at the point at which they leave the ped module.
26. All external wiring utilized in the ped modules shall be anti-capillary type wire to prevent the wicking of moisture to the interior of the ped module.
27. The Hand and Person Icons shall utilize separate power supplies. On countdown products, the countdown ped module must have its own power supply but may take the incoming AC power from the hand / person AC signal lines. All power supplies shall be located inside the ped module.
28. All power supplies shall be conformally coated for additional protection.
29. Off State Voltage Decay: When the hand or person icon is switched from the On state to the Off state the terminal voltage shall decay to a value less than 10 VAC RMS in less than 100 milliseconds when driven by a maximum allowed load switch leakage current of 10 milliamps peak (7.1 milliamps AC).
30. For a minimum period of 60 months, measured at 80 to 135 VAC RMS and over the ambient temperatures of -40°C to +74°C (-40°F to +165°F), the minimum maintained luminance values for the ped modules, when measured normal to the plane of the icon surface, shall not be less than:
 - Walking Person, White: 2,200 cd/m2
 - Upraised Hand, Portland Orange: 1,400 cd/m2
 - Countdown Digits, Portland Orange: 1,400 cd/m2

31. The external lens shall have a textured outer surface to reduce glare.
32. Icons that are printed on the lens shall be on the interior surfaces in order to prevent scratching and abrasion to the icons.
33. All icons and numbers shall have a uniform incandescent non-pixelated appearance.
34. All exposed components of a ped module shall be suitable for prolonged exposure to the environment, without appreciable degradation that would interfere with function or appearance. As a minimum, selected materials shall be rated for service for a period of a minimum of 60 months in a south-facing Arizona Desert installation.
35. All LEDs used to illuminate the ped module shall use material that has industry acceptance for use in outdoor applications. At no time is the use of LEDs that utilize AlGaAs technology acceptable.
36. The countdown display shall consist of two 7 segment digits as shown below. All countdown display digits shall be 9 inches in height for use in all size crosswalks in compliance with MUTCD recommendations.

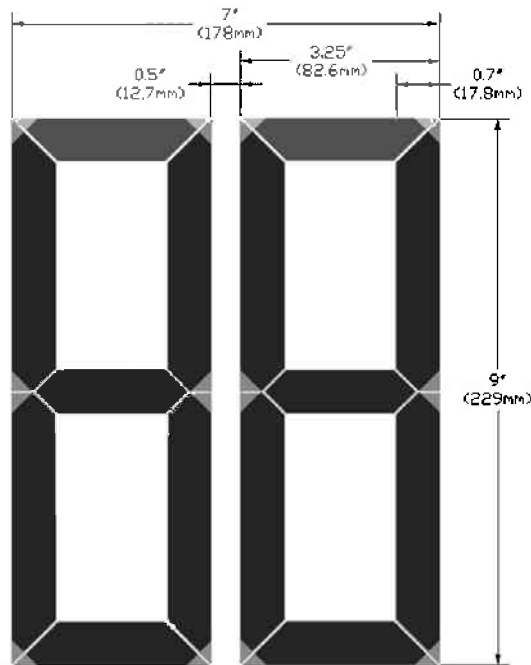


Figure 2: Countdown Display

37. Ped modules shall be repaired or replaced if the ped module fails to function as intended due to workmanship or material defects within warranty period.
38. Ped modules shall be repaired or replaced if the ped module exhibit luminous intensities less than the minimum specified values within 60 months of the date of delivery.
39. The manufacturer shall clearly disclose the country in which the factory of ped module origin is located, the name of the company or organization that owns the factory including all of its parent companies and organizations, and their respective country of corporate citizenship.

T. Pedestrian, Bicycle and Equestrian Push Buttons

Pedestrian, bicycle, and equestrian push buttons shall conform to the provisions in Section 86-5.02, "Pedestrian Push Button Assemblies", of the Standard Specifications and these Special Provisions.

Push button assembly shall be Type B per Standard Plans ES-5C.

Push button housing shall be die-cast or permanent mold cast aluminum powder coated frame with stainless steel inserts and sign screws.

Push button sign shall be white powder coat base with black heat cured ink. Right and left arrow signs shall be doubled sided.

Push button shall be Polara Engineering, Inc. model BDLM2-Y or approved equal.

Push button shall utilize solid-state Piezo switch technology, pressure activated, two-tone audible, visual LED confirmation of actuation and shall be ADA compliant.

The equestrian push buttons (EPB) shall be installed at 6 feet above finish grade or as directed by the Engineer. The Engineer shall approve the EPB placement on each pole prior to installation.

U. Detectors

Detectors shall conform to the provisions in Section 86-5, "Detectors", of the Standard Specifications and these Special Provisions.

Delay timers shall delay calls only during display of the associated red or yellow indications. If a vehicle departs the area of detection prior to expiration of the assigned delay period, the timer shall reset and no call shall be placed upon the controller. During display of the associated green indication, detectors shall operate in the present mode and calls shall not be delayed.

Inductive Loops

Detector loop configuration shall be Type E per Standard Plans ES-5B unless otherwise shown on the construction plan, in the Special Provisions, or as directed by the Engineer.

Limit Line detector loop configuration shall be modified Type E with diagonal saw cuts and wire winding conforming to Type D loop configuration.

Detector loop wire shall be Type 2.

Detector loop lead in cable shall be Type B.

Detector loop curb terminations shall be Type A in accordance with Standard Plans ES-5D.

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 megohms)
- resistance (measured by ohms)
- inductance (measured in microhenries)

Video Detection

The contractor shall furnish and install video detection cameras (VDC), video detection processors (VDP), extension modules (EM), access module (AM), an industry standard 3-button USB mouse, a drawer mounted 17 inch LCD monitor, surge suppressors, and all necessary cabling and auxiliary equipment to make the video detection systems fully functional for the intended operation.

All equipment supplied shall come from and qualified by the VDP supplier to ensure proper system operation.

The VDC shall attach to the top of luminaire mast arm using mounting bracket provided by manufacturer, or the backside of signal mast arm using Pelco Astrobrac with 6' extension or approved equal. The Engineer shall approve the final camera placements.

The video detection systems shall be installed by supplier factory certified installers per recommended method provided in the supplier's installation manuals. Proof of factory certification shall be provided.

Video Detection Zones:

Placement of detection zones shall be done by using the supplied USB mouse connected to the VDP. Detection zones are drawn on the video image from the video camera displayed on a video monitor using the menu and graphical interface built into the VDP. The menu shall facilitate placement of detection zones and setting of zone parameters or to view system parameters.

Detection zone setup shall not require site-specific information such as latitude, longitude, date and time to be entered into the system. No separate computer shall be required to program the detection zones.

Each detection zone shall be user definable in size and shape to suit the site and the desired vehicle detection region. A detection zone shall be approximately the width and length of one car.

A single detection zone shall be able to replace multiple inductive loops and the detection zones shall be OR'ed as the default or may be AND'ed together to indicate vehicle presence on a single phase of traffic movement.

The VDP shall provide a minimum of 24 channels of vehicle presence detection/detection zones per camera through a standard detector rack edge connector and one or more EMs.

The Video Detection System shall be in compliance with California State Assembly Bill 1581. The system will be able to discriminate between bicycles and automobiles and be able to send bicycle and vehicle actuations from the same lanes to different detection outputs. Additionally the system shall allow an extension time for bicycles that will not apply to vehicular traffic.

Functional Capabilities:

System must have a single point access to multiple rack-mounted video detection units. The access device shall provide interface capabilities to enable multiple rack-mounted video detection processors to be locally and remotely accessed from a single point via one set of user interface devices.

The camera shall be able to transmit the composite video signal, with minimal signal degradation, up to 1000 feet under ideal conditions.

The EM shall be plugged into the appropriate slot in the detector rack to avoid the need of rewiring the detector rack. The extension module shall be connected to the VDP by an 8-wire cable with modular connectors.

The EM and VDP communications shall be accommodated by methods using differential signals to reject electrically coupled noise. The EM shall be available in both 2 and 4 channel configurations programmable from the VDP.

The VDP shall have video input in NTSC composite video format and shall be digitized and analyzed in real time.

The VDP shall have a nine-pin RS232 port that is multi-drop compatible for communications with an external computer. The VDP shall be able to accept new detector patterns from and send its detection patterns to an external computer through this RS-232 port. A Windows™ based software designed for local or remote connection for uploading and downloading data, and providing video capture, real-time detection indication and detection zone modification capability shall be provided with the system.

The VDP shall store up to three different detection zone patterns within the VDP memory. The VDP's memory shall be non-volatile to prevent data loss during power outages. The VDP shall continue to operate (e.g. detect vehicles) using the existing zone configurations even when the operator is defining/modifying a zone pattern. The new zone configuration shall not go into effect until the operator saves the configuration. Each configuration can be uniquely labeled for identification and the current configuration letter is displayed on the monitor. The selection of the detection zone pattern for current use shall be done through a local menu selection or remote computer via RS-232 port. It shall be possible to activate a detection zone pattern for a camera from VDP memory and have that detection zone pattern displayed within 1 second of activation.

The VDP shall provide dynamic zone reconfiguration to enable normal detector operation of existing channels except the one where a zone is being added or modified during the setup process. The VDP shall output a constant call on any detection channel corresponding to a zone being modified.

The VDP shall detect vehicles in real time as they travel across each detector zone.

The VDP shall output a constant call for each enabled detector output channel if a loss of video signal occurs. The VDP shall output a constant call during the background learning period. The background learning period shall be not more than three minutes.

The VDP shall be capable of detecting a low-visibility condition automatically, such as fog, and place all defined detection zones in a constant call mode. The VDP shall automatically revert to normal detection mode when the low-visibility condition no longer exists. A user-selected output shall be active during the low-visibility condition that can be used to modify the controller operation if connected to the appropriate controller input modifier(s).

Detection shall be at least 98% accurate in good weather conditions and at least 96% accurate under adverse weather conditions (rain, snow, or fog). Detection accuracy is dependent upon site geometry; camera placement, camera quality and detection zone location, and these accuracy levels do not include allowances for occlusion or poor video due to camera location or quality.

Detection zone outputs shall be configurable to allow the selection of presence, pulse, extend, and delay outputs. Timing parameters of pulse, extend, and delay outputs shall be user definable between 0.1 to 25.0 seconds.

Up to six detection zones shall be capable to count the number of vehicles detected. The count value shall be internally stored for later retrieval through the RS-232 port. The data collection interval shall be user definable in periods of 5, 15, 30 or 60 minutes.

System software shall

- Utilize a dual redundant hybrid tracking algorithm to enhance vehicle presence detection and data collection.
- Include a moving shadow and occlusion rejection algorithm that is activated by selection of a drop down menu tab.
- Include a menu selectable zone type labeled "Bike" that is specifically designed to detect bicycles.
- Include a virtual QWERTY keyboard that is present when performing any labeling functions for the detection zones and cameras.
- Include the ability to copy completed zones with one mouse click, drag and drop single zones, rows of zones together and entire detection configurations.

VDP & EM Hardware:

The VDP and EM shall be specifically designed to mount in a standard NEMA TS-1, TS-2, 2070 ATC, 170 type detector rack, using the edge connector to obtain power and provide contact closure outputs.

No adapters shall be required to mount the VDP or EM in a standard detector rack. Detector rack rewiring shall not be required or shall be minimized.

Both VDP and EM shall operate in a temperature range from -34°C to +74°C and a humidity range from 0% RH to 95% RH, non-condensing.

Both VDP and EM shall be powered by 12 or 24 volts DC. These modules shall automatically compensate for the different input voltages.

Both VDP and EM shall include detector output pin out compatibility with industry standard detector racks.

Both VDP and EM shall have a detector test switch on the front panel to allow the user to place calls on each channel. The test switch shall be able to place either a constant call or a momentary call depending on the position of the switch.

The VDP power consumption shall not exceed 300 milliamps at 24 VDC. The EM power consumption shall not exceed 120 milliamps at 24 VDC.

The VDP shall utilize flash memory technology to enable the loading of modified or enhanced software through the RS232 port without modifying the VDP hardware.

The VDP shall include the following on the front panel:

- A multi-drop compatible RS232 port, a 9-pin "D" subminiature connector, for serial communications with a remote computer.
- Detection indication such as LED for each channel of detection that display detector outputs in real time when the system is operational.
- One or two BNC video input connection suitable for RS170 video inputs as required. The video input shall include a switch selectable 75-ohm or high impedance termination to allow camera video to be routed to other devices, as well as input to the VDP for vehicle detection. Video must be inputted via a BNC connector on the front face of the processor. RCA type connectors/jacks for video input are not allowed. Video shall not be routed via the edge connectors of the processor.
- One BNC video output providing real time video output that can be routed to other devices. A RCA type connector/jack for video output is not allowed.

Video Detection Camera:

The camera shall be housed in a weather-tight sealed enclosure consists of the following:

1. The enclosure shall be made of 6061 anodized aluminum.
2. The enclosure shall be field rotatable to allow proper alignment between the camera and the traveled road surface.
3. The enclosure shall be equipped with a sunshield. The sunshield shall include a provision for water diversion to prevent water from flowing in the camera's field of view. The camera enclosure with sunshield shall be less than 6" diameter, less than 18" long, and shall weigh less than 6 pounds when the camera and lens are mounted inside the enclosure.
4. The enclosure shall be design so that the pan, tilt and rotation of the camera assembly can be accomplished independently without affecting the other settings.
5. The enclosure shall include a proportionally controlled Indium Tin Oxide heater design that maximizes heat transfer to the lens. The output power of the heater shall vary with temperature, to assure proper operation of the lens functions at low temperatures and prevent moisture condensation on the optical faceplate of the enclosure.
6. The glass face on the front of the enclosure shall have:
 - a. An anti-reflective coating to minimize light and image reflections.

- b. A special coating to minimize the buildup of environmental debris such as dirt and water.

The camera shall produce a useable video image of the bodies of vehicles under all roadway lighting conditions, regardless of time of day. The minimum range of scene luminance over which the camera shall produce a useable video image shall be the minimum range from nighttime to daytime, but not less than the range 1.0 lux to 10,000 lux.

The imager luminance signal to noise ratio shall be more than 50 dB. In harsh backlit conditions, vehicles can be detected flawlessly with >100dB of dynamic range.

The camera shall be digital signal processor based and shall use a CCD sensing element and shall output color video with resolution of not less than 540 TV lines. The CCD imager shall have a minimum effective area of 811(h) x 508(v) pixels.

The camera shall include an electronic shutter control based upon average scene luminance and shall be equipped with an auto-iris lens that operates in tandem with the electronic shutter.

The camera shall utilize automatic white balance.

The camera shall include a variable focal length lens with variable focus that can be adjusted, without opening up the camera housing, to suit the site geometry by means of a portable interface device designed for that purpose and manufactured by the detection system supplier.

The horizontal field of view shall be adjustable from 5.4 to 50.7 degrees. This camera configuration may be used for the majority of detection approaches in order to minimize the setup time and spares required by the user. The lens shall have a 27x zoom.

The lens shall also have an auto-focus feature with a manual override to facilitate ease of setup.

The camera shall incorporate the use of preset positioning that store zoom and focus positioning information. The camera shall have the capability to recall the previously stored preset upon application of power.

The camera electronics shall include automatic gain control to produce a satisfactory image at night.

When mounted outdoors in the enclosure, the camera shall operate satisfactorily in a temperature range from -34 °C to +60 °C and a humidity range from 0% RH to 100% RH. Measurement of satisfactory video shall be based upon VDP system operation.

The camera shall be powered by 120-240 VAC 50/60 Hz. Power consumption shall be 30 watts or less under all conditions.

The camera shall view approaching vehicles at a distance not to exceed 350 feet for reliable detection (height to distance ratio of 1:10). Camera placement and field of view shall be unobstructed and as noted in the installation documentation provided by the supplier.

There shall be at least 2 options for camera set up, diagnostic testing, and viewing video when it is mounted on mast arm or pole using lens adjustment module supplied by the VDP supplier:

1. Connected directly to the camera.
2. Connected to the coaxial cable from the cabinet.

The video signal shall be fully isolated from the camera enclosure and power. Cable terminations at the camera for video and power shall not require crimping tools.

No BNC or other connector shall be used for the coaxial video cable termination at the camera.

The power connection at the camera shall use connector terminations that only require the use of wire strippers and a standard screwdriver. No special crimping tools or other types of terminations shall be used.

A weather-proof protective cover shall be provided shall be provided to protect all terminations at the camera. No special tooling shall be required to remove or install the protective cap.

Cabling and Cable Connections:

The coaxial cable to be used between the camera and the VDP in the traffic cabinet shall be Belden 8281. The coax cable shall be a continuous unbroken run from the camera to the VDP. This cable shall be suitable for installation in conduit or overhead with appropriate span wire. A BNC plug connector shall be used at the cabinet end. The coaxial video cable shall be stripped and terminated at the camera and cabinet per manufacturers' instructions (no BNC or other connector shall be used at the camera). The coaxial cable, BNC connector used at the cabinet termination, and crimping tool shall be approved by the supplier of the video detection system and the manufacturer's instructions must be followed to ensure proper connection.

The power cable shall be three 16 AWG conductor cable with a minimum outside diameter of 0.325 inch and a maximum diameter of 0.490 inch. The power cable shall be terminated at the camera per manufacturers' instructions and shall only require standard wire strippers and a screw driver for installation (no special connectors or crimping tools shall be used for installation). The cabling shall comply with the National Electric Code, as well as local electrical codes. Cameras shall not acquire power from the luminaire.

A Din Rail mounted AC power panel assembly shall be supplied by the video detection manufacturer that will include a minimum of one convenience receptacle, four camera chassis ground connections, four camera AC neutral (AC-) connections, four 2 amp camera circuit breakers for hot (AC+) connections, and one AC source connection for Line, Neutral and Ground wires. A Din Rail video surge suppression protection panel assembly shall also be supplied by the video detection manufacture. One panel shall accommodate up to six EDCO surge suppressors. This equipment shall be installed, including termination of all necessary wiring, per the video detection manufacturer requirements for the intended use.

Maintenance and Support:

The supplier shall maintain an adequate inventory of parts to support maintenance and repair of the system. These parts shall be available for delivery within 30 days of placement of an acceptable order at the supplier's then current pricing and terms of sale for said parts.

The supplier shall maintain an ongoing program of technical support for the access unit and video detection system. This technical support shall be available via telephone, or via personnel sent to the installation site upon placement of an acceptable order at the supplier's then current pricing and terms of sale for on-site technical support services.

Installation or training support shall be provided by factory-authorized representative.

All product documentation shall be written in the English language.

V. LED Luminaires

Luminaires shall conform to the provisions in Section 86-6, "Lighting", of the Standard Specifications and these Special Provisions.

Luminaires shall conform to the following Standards and Special Provisions:

Standards

- ANSI/NFPA 70, National Electrical Code
- FCC 47 CFR Part 15, Code Of Federal Regulations (CFR) testing standard for electronic equipment

- IEEE C62.41, Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits
- IESNA LM-79, Electrical and Photometric Measurements of Solid-State Lighting Products
- IESNA LM-80, Approved Method for Measuring Lumen Maintenance of LED Light Sources
- IESNA TM-15, Luminaire Classification System for Outdoor Luminaires
- NEMA SSL 3-2010, High-Power White LED Binning for General Illumination
- UL1598, Standard for Safety of Luminaires

Led Luminaires

Material and specifications for each luminaire are as follows:

- Luminaire shall be Navion LED, model NVN-AE-03-E-U-T3-10K-U-AP or approved equal.
- Each luminaire shall consist of an assembly that utilizes LEDs as the light source. The complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).
- Each luminaire shall be rated for a minimum operational life of 60,000 hours at an average operating time of 11.5 hours per night at 40°C (104°F).
- The rated operating temperature range shall be -40°C (-40°F) to +40°C (104°F).
- Each luminaire is capable of operating above 50°C (122°F), but not expected to comply with photometric requirements at elevated temperatures.
- Photometry must be compliant with IESNA LM-79.
- Each luminaire shall meet all parameters of this specification throughout the minimum operational life when operated at the average nighttime temperature.
- The individual LEDs shall be constructed such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
- Luminaire shall be constructed such that LED modules may be replaced or repaired without replacement of whole luminaire.
- Each luminaire shall be listed with Underwriters Laboratory, Inc. under UL1598 for luminaires in wet locations.

Technical Requirements

1. Electrical
 - a. Luminaire shall have a minimum efficacy of 70 lumens per watt and shall consume no more than 160 watts. The luminaire shall not consume power in the off state.
 - b. Operation Voltage: The luminaire shall operate from a 60 HZ \pm 3 HZ AC line over a voltage ranging from 108 VAC to 305 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
 - c. Power Factor: The luminaire shall have a power factor of 0.9 or greater.
 - d. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent.
 - e. Surge Suppression: The luminaire on-board circuitry shall include surge protection devices (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The SPD protects the luminaire from damage and failure for common (Line-to-Ground) and differential (Line-to-Line) mode transient peak currents up to 10 kA (minimum). SPD conforms to UL 1449. SPD performance has been tested per procedures in ANSI/IEEE C62.41-2:2002 category C high exposure and ANSI C136.2 10kV BIL. The SPD shall fail in such a way as the Luminaire will no longer operate. The SPD shall be field replaceable.
 - f. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.

- g. RF Interference: LED Drivers must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.
2. Photometric Requirements
- a. Optical Assemblies: LEDs shall be provided with discreet over optical elements to provide an IESNA Type III distribution. Additional distributions for glare control shall be utilized when direct source must be mitigated. Mitigation must take place without external shielding elements. Optical assemblies shall have a minimum efficiency of 85% regardless of distribution type. All LEDs and optical assemblies shall be mounted parallel to the ground. All LEDs shall provide the same optical pattern such that catastrophic failures of individual LEDs will not constitute a loss in the distribution pattern.
 - b. No more than 3% of the total luminaire lumens shall be in the 80° to 90° range and no lumens will be emitted above 90°. BUG rating shall not exceed B2-U0-G3.
 - c. Light Color/Quality: The luminaire shall have a correlated color temperature (CCT) of 4,000K +/-275K. The color rendition index (CRI) shall be greater than 70.
 - d. 75% or more of the total luminaire lumens shall be to the street side of the luminaire.
 - e. The optical assembly of the luminaire shall be protected against dust and moisture intrusion per the requirements of IP-66 (minimum) to protect all optical components.
 - f. Luminaire manufacturer shall provide the LED manufacturers LM-80 report.
 - LM-80 report shall be at a drive current of 1000mA or less
 - LM-80 report shall be a minimum of 10,000 hours
 - LM-80 report shall show lumen depreciation of 1% or less for all LED case temperatures on the report including 55°C, 85°C, 105°C
3. Thermal Management
- a. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
 - b. The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.
 - c. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
 - d. The luminaire shall have a minimum heat sink surface such that LED manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature.
 - e. The heat sink material shall be aluminum.
4. Physical and Mechanical Requirements
- a. Thermally conductive extruded aluminum heat sinks shall be secured to a clear anodized extruded aluminum door frame with a cast aluminum end cap for optimum cooling. The cast aluminum electrical compartment shall be separate from the LED array to ensure cooler operating temperatures of the driver. Access to the electrical compartment shall be tool-less by use of stainless steel latches. Driver and surge module shall be secured to the swing down door which can easily be removed and exchanged without the use of tools by separating a quick disconnect electrical connection. Housing shall be designed to prevent the buildup of water on the top of the housing. Each optical assembly shall be field rotatable and shall have "street side" and "house side" cast into the optics to indicate beam pattern. Each optic shall be electrically connected with a quick disconnect plug and secured to the housing with four stainless steel screws.
 - b. Luminaire shall include cast in pipe stops, leveling steps and a four bolt mounting system capable of accommodating 1¼" to 2" ID pipe (1 5/8" to 2 3/8" OD).
 - c. The maximum weight of the luminaire shall be 30 lbs and the maximum effective projected area shall not exceed 1.4 sq ft.
 - d. The housing shall meet the requirements for NEMA/UL wet location, be UL listed and gray in color with a flat or semi-gloss sheen.

- e. Luminaire options to include a NEMA photocontrol receptacle and dimming driver.
- f. The power supply shall be contained inside the luminaire and a minimum IP rating of IP-65.
- g. The assembly and manufacturing process for the LED luminaire shall be designed to assure all internal components are adequately supported to withstand mechanical shock and vibration. Luminaire shall withstand vibration, meeting ANSI C136.31 American Standard for Roadway and Area Lighting Equipment – Luminaire Vibration for normal and bridge operation (3G minimum).

5. Materials

- a. Housing and door frame shall be aluminum with a nominal 2.5 mil thick paint finish able to withstand a 3000 hour salt spray test as specified in ASTM Designation: B117. Housing shall have a minimum IP rating of IP-65.
- b. Each refractor or lens shall be made from UV inhibited high impact optical grade material and be resistant to scratching.
- c. All aluminum used in housing and brackets shall be a marine grade alloy with less than 2% copper. All exposed aluminum shall be anodized.
- d. Polymeric materials (if used) of enclosures containing either the power supply or electronic components of the luminaire shall be made of UL94VO flame retardant materials. The len(s) of the luminaire are excluded from this requirement.
- e. Paint or powder coating of the housing shall conform to the requirement of the Caltrans Standard Specifications.

Identification

Each LED luminaire shall have the manufacture's name, trademark, model number, serial number, date of manufacture (month-year), and lot number as identification permanently marked inside each unit and the outside of each packaging box.

The operation characteristics such as rated voltage and rated power in watts and Volt-Ampere shall be permanently marked inside each LED luminaire unit.

Quality Assurance

LED luminaire manufacturer shall provide 5-year warranty on LED luminaires that includes LEDs, housing, drivers and finish.

LED luminaire manufacturer shall not use IESNA LM-80 data to predict luminaire lifetime and shall demonstrate a suitable testing program incorporating high heat, high humidity and thermal shock test regimens to ensure system reliability and to substantiate lifetime claims.

Electrical and light technical properties shall be recorded for each LED luminaire during manufacture. This should include lumen output, CCT, and CRI at a minimum. Each luminaire shall utilize a unique serial numbering scheme. Technical properties must be made available for a minimum of 5 years after the date of manufacture.

Luminaires shall be fully assembled and individually electrically tested prior to shipment.

Submittals

Product data submitted for approvals shall include, but not limited to materials, finishes, photometric performance, photometric layouts, dimensional information and LM-79 report for each luminaire

conducted by National Voluntary Laboratory Accreditation Program (NVLAP), accredited photometric laboratory.

Delivery, Storage and Handling

Deliver luminaires and components carefully to avoid breakage, bending and scoring finishes. Do not install damaged equipment.

Store luminaires and accessories in original cartons and in clean dry space; protect from weather and construction traffic.

Each luminaire shall be furnished without the photoelectric unit receptacle.

Each luminaire shall have a 5-amp inline fuse installed inside the standard's hand hole.

W. Internally Illuminated Street Name Signs

Internally illuminated street name signs (IISNS) shall conform to the provisions in Section 86-6.09, "Internally Illuminated Street Name Signs", of the Standard Specifications and these Special Provisions.

The sign fixture, panels, and mounting assemblies shall be designed and constructed to prevent deformation, warp or failure when subjected to a minimum of 100 mph wind loads, as set forth in the latest AASHTO publication, "Standard Specifications for Structural Supports of Highway Signs, Luminaires, and Traffic Signals", and amendments thereto. The IISNS manufacturer shall submit a certificate of compliance conforming to the provisions in Section 6-3.05E, "Certificates of Compliance", with each lot of IISNSs delivered.

The IISNS shall be double-faced Edge-lit LED sign with white translucent high-performance ASTM Type XI reflective border, arrows, and lettering using 12" uppercase and 9" lowercase Clearview Series 5-W fonts. The background shall be green match color no. 14109 of FED-STD-595.

The standard IISNS height shall be 2' and length shall be 6', 8' or 10' attached to the 10 feet IISNS mast arm with Pelco No. SE-5015 mast arm sign bracket and Pelco No. SP-5668-L safety cable, or approved equal, per County Standard No. 1200.

Each Edge-lit LED sign will be fabricated and shipped with two (2) stainless steel eyebolts, closed eye, 1/4-20, 1/2" threaded shank w/ shoulder, rated at 460 lbs. each. A 1/4x1" flat stainless steel washer will be placed between the sign enclosure and each eyebolt. The eyebolts will be connected to the top rail of the sign enclosure with stainless steel hardware, and shall be located within 1.75" of the square-round tri-stud mounting points attached to the top of the sign enclosure.

X. Photoelectric Controls

Photoelectric controls shall conform to the provisions in Section 86-6.11, "Photoelectric Controls", of the Standard Specifications and these Special Provisions.

Photoelectric controls shall be a dual Type V for luminaires and internally illuminated street name signs conforming to the County Standard No. 1207.

Photoelectric units shall be the delay type.

Y. Emergency Vehicle Preemption System

Furnish and install complete and functioning emergency vehicle preemption (EVP) system as intended per plans, the manufacturer, and these special provisions.

The EVP system shall consist of the following equipments or components:

- Optical detector for each approach, as shown on the plans
- Rack-mounted 4-channel phase selectors for 8-phase operation
- Detector cable

The EVP system shall be designed to prevent simultaneous pre-emption by two or more emergency vehicles on separate approaches to the intersection.

The Engineer shall approve EVP sequence of operation prior to timing and turn-on of each respective traffic signal.

At locations where optical detectors are not to be installed, EVP cable shall be installed for future use. The following also apply:

1. EVP cable shall be installed, without splices, between the controller cabinet and each mast arm traffic signal pole.
2. EVP cable shall be connected to the EVP rack terminals within the controller cabinet.
3. Each mast arm EVP detector mounting shall be drilled and tapped in its ultimate location. In lieu of the detector, install approved water tight UL listed electrical box. EVP cable shall be installed to terminate within the mast arm mounted electrical box. Excess cable shall be coiled within the electrical box sufficient for future installation of the EVP system.

Optical Detector

The optical detector shall be mounted on the indicated signal mast arm per County Standard No. 1202.

Each optical detector shall be waterproof unit capable of receiving optical energy from dual directions and have an adjustable turret configuration. The reception angle for each optical detector unit shall be a minimum of eight (8) degrees in all directions about the aiming axis of the unit.

Dual detectors shall utilize only one optical cable per detector.

Internal circuitry shall be solid state and electrical power shall be provide by the associated discrimination module.

Each optical detector unit shall have a minimum of a 3/4 inch NPT opening used for mounting and for bringing the connecting cable into the terminal block located within the assembly. 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 shall meet the requirements of IPCEA-S-61-402/NEMA WC 5, Section 7.4, 600 V Control cable, 75 degrees C, Type B, and the following:

1. The cable shall contain 3 conductors, each of which shall be AWG# 20 (7 x 28) stranded, tinned copper. Insulation of individual conductors shall be color-coded: 1-Yellow, 1-Orange, and 1-Blue.
2. The shield shall be either tinned copper braid or aluminized polyester film with a nominal 20% overlap. When film is used, an AWG# 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.
3. The jacket shall be marked as required by IPCEA/NEMA.

The cable run between each detector and the Traffic Controller cabinet shall be continuous without splices.

Phase Selector

Each phase selector shall be compatible and usable with a Model 170E or 2070 controller unit, and shall be mounted in the input file of a Model 332 or Model 333 JP controller cabinet.

Each phase selector shall be capable of operating at least two or more channels, each of which shall provide and independent output for each separate input.

Phase Selector shall be a four-channel, dual priority, Multimode encoded signal device designed for use with both infrared and GPS emitters and optical detectors.

Phase Selectors and Optical detectors shall be manufactured by a single manufacturer

Phase Selector shall recognize and discriminate among three distinct frequency rates via high priority, low priority and probe priority infrared and GPS signals.

Phase selector shall further discriminate among 254 agency ID's, 15 classes of vehicle identification codes and 10,000 individual vehicle codes per class, for more than 38 million total per priority level.

Phase selector shall be capable of operating unlimited intersections and directions.

Phase selector shall have on the front panel, USB, serial and Ethernet capabilities

Phase selector shall be capable of accepting infrared signals from LED and or strobe technologies

Phase selector shall store the following records:

- Intersection name
- Date and time of activity
- Vehicle class and code of activating vehicle
- Activating vehicle's ID number
- Agency ID
- Channel called
- Priority of the activity
- Final green activity displayed at end of call
- Time spent in the final greens
- Duration of the activity
- Turn signal status
- Relative priority level
- Capability to playback up to the last 250 seconds of the 100 most recent calls

Each phase selector, when used with its associated optical detectors, shall perform as a minimum, the following:

1. Receive Class I and Class II signals.
2. Decode the signals based on optical frequency, at 9.639 Hz + or -0.119 Hz for Class I signals and 14.035 Hz + or -0.255 Hz for Class II signals.
3. Establish the validity of received signals based on optical 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 signal for a minimum period of 4.0 seconds.

4. 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 a Class I signal, the output shall be a 6.25 Hz + or – 0.1 %, rectangular waveform with a 50 % duty cycle. For Class II signal, the output shall be steady.

Each phase selector shall receive power from the controller cabinet at either 12 VDC or 120 VAC.

Auxiliary inputs for each channel may enter each module through a front panel connector or by a parallel hook-up of the associated detector cables at the input location.

The phase selector shall provide an optically isolated output for each channel to the Model 170 controller unit. All outputs signals shall comply with NEMA signal level definitions and shall be compatible with the Model 170 controller assemblies’ inputs.

Each phase selector shall be provided with means of preventing transients received by the detector from affecting the Model 170 controller assembly.

Each phase selector shall have a single connector board and shall occupy one slot of the input file. The front panel of each phase selector module shall have a handle to facilitate withdrawal and have the following controls and functions for each channel:

1. Range adjustments for both class I and Class II signals.
2. 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.
3. A “signal” indication and a “call” indication each for Class I and for Class II signals. The “signal” indications denote that a signal, which is not valid, has been received; a “call” indication denotes a steady, valid signal has been received. These 2 indications may be accomplished with a single indication lamp.

In addition, the front panel shall be provided with additional connectors or ports used to perform other functions as specified by the manufacturer.

Cabinet Wiring

Wiring for a Model 332 cabinet shall conform to the following:

1. Slots 12 and 13 of input file “J” shall be wired to accept either a 2 channel or a 4 channel module.
2. Field wiring for the primary detectors, except the 24 VDC power, shall terminate on either terminal block 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:
 - a. TB-9 – 1 = Not Used
 - b. TB-9 – 2 = + 24 VDC Out (Orange)
 - c. TB-9 – 3 = + 24 VDC Out (Orange)
 - d. TB-9 – 4 = EVA Detector (Yellow)
 - e. TB-9 – 5 = EVC Detector (Yellow)
 - f. TB-9 – 6 = DC Common Out (Blue)
 - g. TB-9 – 7 = EVB Detector (Yellow)
 - h. TB-9 – 8 = EVD Detector (Yellow)
 - i. TB-9 – 9 = DC Common Out (Blue)

Assuming TB9 – 2 and TB9 – 3 are unused on the “J” File, move wires on J11-J & J11-K (Twisted Pair) to J12-E & J13-E, respectively.

Field wiring for auxiliary detectors may terminate on terminal board TB-0 (If unused) in the controller cabinet. Use manufactures recommended wiring for these connections.

System Operation

The contractor shall demonstrate that the components of each system are compatible and will perform satisfactorily as a system. Satisfactorily performance shall be determined using the following test procedure during the functional test period:

1. Each system to be used for testing shall consist of an optical detector, an optical detector cable and a phase selector module.
2. The phase selector shall be installed in the proper input file slot of the Model 332 or 333 controller cabinet assembly.
3. Two tests shall be conducted; one using a Class I signal emitter and a distance of 1000 feet between the emitter and the detector, the other using a Class II signal emitter and a distance of 1800 feet between the emitter and the detector. Range adjustments on the phase selector shall be set to "Maximum" for each test.
4. During the tests of the Class I and Class II emitters, the proper response from the Model 170E and 2070 controller unit during the "ON" interval and there shall be no improper operation of the Model 170E or 2070 controller unit or the monitor during the "OFF" interval.

Arrange for a technician from the EVP manufacturer, to be present for the first day of the traffic signal and lighting function test to insure proper installation and functioning of the EVP equipment.

Arrange for a technician from the controller assembly manufacturer to perform any controller modifications required for the installation, or operation, of the EVP equipment.

Z. GPS Universal Time Sources

The GPS Universal Time Source shall be a McCain model M44342 or approved equal. The Engineer shall approve any alternate GPS time source prior to installation.

The GPS Universal Time Source shall incorporate a precision GPS receiver and a microprocessor to decode the time signals received from the GPS satellite network. The Universal Time Source shall interface this time signal to a model 170E controller (using Bi-Tran local software) to provide an accurate clock update to the traffic signal controller.

The GPS Universal Time Source shall meet or exceed the following criteria:

- Operate in temperatures from -30°C to +80°C.
- Receive power through 170E controller's ACIA port.
- Provide 170E controller with the time, date, and day of the week data.
- Software configured time zone and daylight savings operations.
- Support RS-232C serial data rates at 300, 600, 1200, 2400, 48000, 9600 and 19200 bps.
- Provide LED indicators for communication status to a satellite.
- Provide a weatherproof disc antenna no greater than 3" diameter x 1" height to be mounted directly to the top of the traffic signal controller cabinet.
- Provide all cabling and connectors with the correct pin assignments to interface the GPS unit to antenna and to 170E controller.

Proper gaskets or other weatherproofing materials for the antenna shall be supplied and installed to prevent water or moisture from entering the traffic signal controller cabinet.

AA. Battery Backup System

This special provision establishes the minimum requirements for a battery backup system (BBS) that shall provide power to a traffic signal system in the event of a power failure or interruption.

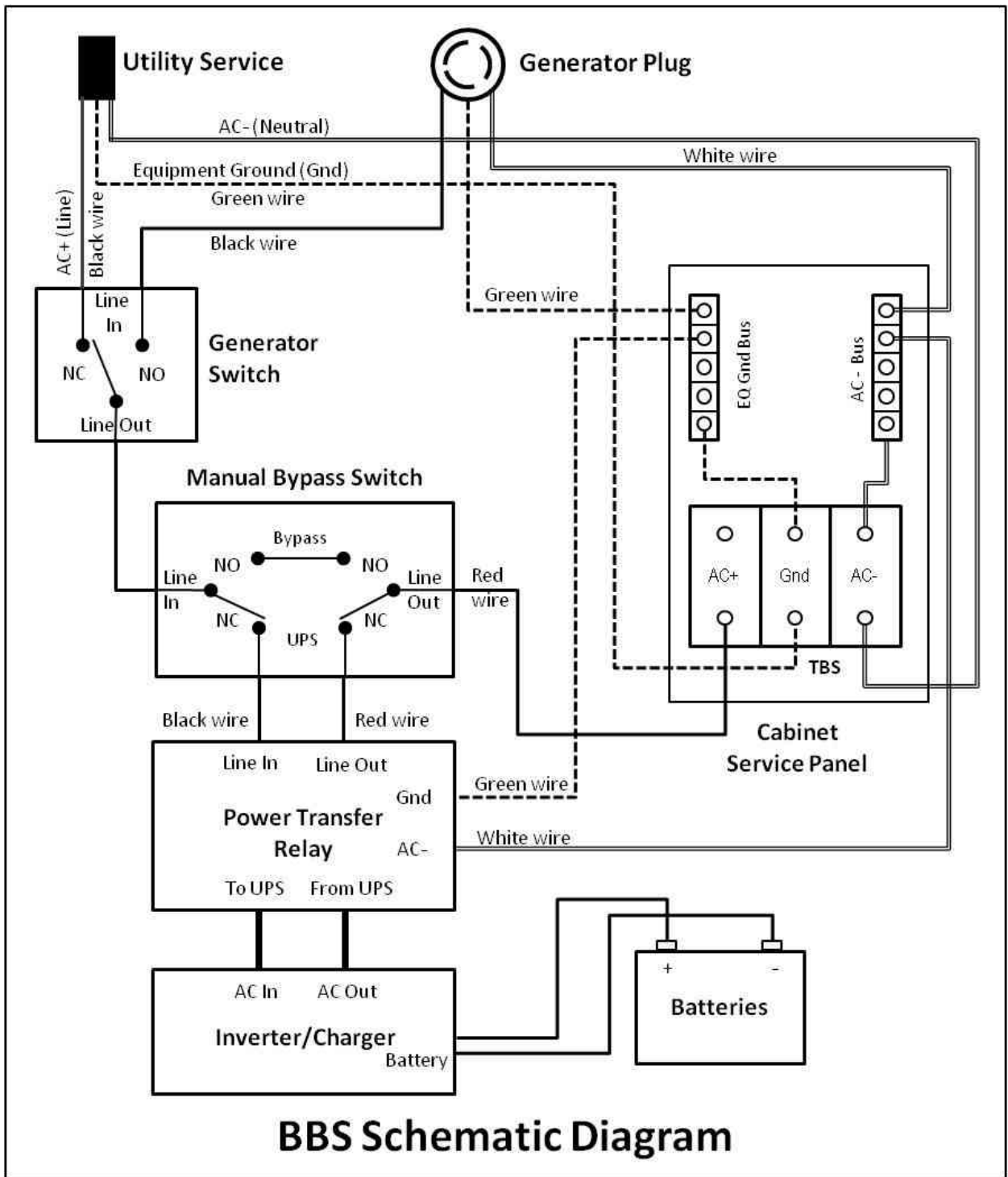
The BBS shall be designed for outdoor applications, in accordance with the current edition of Chapter 1, Section 8 requirements of Transportation Electrical Equipment Specifications (TEES).

The BBS batteries shall be external to the traffic signal controller cabinet as specified under “External Battery Cabinet Option” herein unless specified otherwise.

BBS cabinet shall be listed on the current Caltrans pre-qualified product list. The BBS shall include, but not limited to the following:

- cabinet,
- utility line/generator switch,
- inverter/charger,
- power transfer relay,
- a separate manually operated non-electronic bypass switch,
- batteries,
- all necessary hardware, shelving, and interconnect wiring.

The following figure shows BBS components interconnecting with each other and the controller cabinet to ensure interchangeability between all BBS manufacturers.

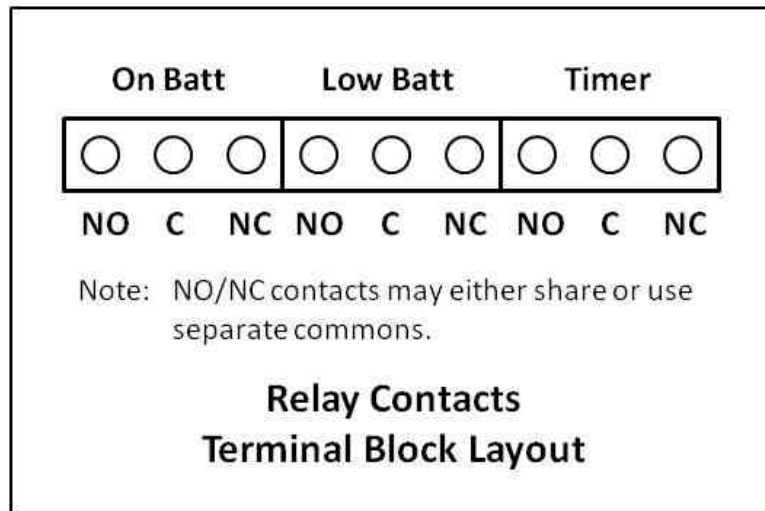


Operation

The BBS shall provide a minimum two (2) hours of full run-time operation for an intersection equipped with all LED traffic signal indications (minimum 1100W active output capacity, with 80% minimum inverter efficiency) and 2 (2) hours of flashing operation.

The maximum transfer time allowed, from disruption of normal utility line voltage to stabilized inverter line voltage from batteries, shall be 65 milliseconds. The same maximum allowable transfer time shall also apply when switching from inverter line voltage to utility line voltage.

The BBS shall provide the user with six (6)-sets of fully programmable normally open (NO) and normally closed (NC) single-pole double-throw (SPDT) dry relay contact closures, available on a panel-mounted terminal block, rated at a minimum 120V/1A, and labeled so as to identify each contact. See below figure for typical configuration.



The first set of NO and NC contact closures shall be energized whenever the unit switches to battery power. Contact shall be labeled or marked “On Batt”.

The second set of NO and NC contact closures shall be energized whenever the battery approaches approximately 40% of remaining useful capacity. Contact shall be labeled or marked “Low Batt”.

The third set of NO and NC contact closures shall be energized two hours after the unit switches to battery power. Contact shall be labeled or marked “Timer”.

The six programmable NO and NC contact closures shall be independently configured to activate under any of the following conditions: On Battery, Low Battery, Timer, Alarm, or Fault.

Operating temperature for inverter/charger, power transfer relay and manual bypass switch shall be –37 °C to +74 °C.

Both the Power Transfer Relay and Manual Bypass Switch shall be rated at 240VAC/30 amps, minimum.

The BBS shall use a temperature-compensated battery charging system. The charging system shall compensate over a range of 2.5 – 4.0 mV/ °C per cell.

The temperature sensor shall be external to the inverter/charger unit. The temperature sensor shall come with 10’ of wire.

Batteries shall not be recharged when battery temperature exceeds 50 °C ± 3 °C.

BBS shall bypass the utility line power whenever the utility line voltage is outside of the following voltage range: 100VAC to 130VAC (± 2VAC).

When utilizing battery power, the BBS output voltage shall be between 110 VAC and 125 VAC, pure sine wave output, ≤ 3% THD, 60Hz ± 3Hz.

BBS shall be compatible with NEMA and Model 332 and 333JP Cabinets, and Model 170, 390 & 2070 Controllers and cabinet components for full time operation.

In cases of low (below 100VAC) or absent utility line power, when the utility line power has been restored at above 105 VAC \pm 2 VAC for more than 30 seconds, the BBS shall transfer from battery backed inverter mode back to utility line mode.

In cases of high utility line power (above 130VAC), when the utility line power has been restored at below 125VAC \pm 2 VAC for more than 30 seconds, the BBS shall transfer from battery backed inverter mode back to utility line mode.

The BBS shall have an automatic tap to step up or step down the output voltage by 10 percent. The resulting output voltages shall remain within the above prescribed voltage range: 100VAC to 130VAC. This capability will extend BBS range for operating on input AC and not reverting to battery power.

BBS shall be equipped to prevent a malfunction feedback to the cabinet or from feeding back to the utility service.

In the event of inverter/charger failure, battery failure or complete battery discharge, the power transfer relay shall revert to the NC (and de-energized) state, where utility line power is connected to the cabinet.

Recharge time for the battery, from "protective low-cutoff" to 80% or more of full battery charge capacity, shall not exceed twenty (20) hours.

Mounting / Configuration

Generator Switch, Inverter/Charger, Power Transfer Relay and manually operated Bypass Switch shall fit inside a typical fully equipped traffic signal controller cabinet.

Mounting method inside the 332 and 333JP cabinet shall be shelf-mount, rack-mount or combination of either. Available rack space for front-mounted inside the 332 and 333JP cabinet is 3U or approximately 6 inches.

All interconnect wiring provided between Generator Switch, Inverter/Charger, Power Transfer Relay, Bypass Switch and Cabinet Terminal Service Block shall be no less than 9 feet of UL Style 1015 CSA TEW with the following characteristics:

- AWG Rating: 10 AWG
- Stranding: 105 strands of 10 AWG tinned copper
- Rating: 600 V, 105 °C, PVC Insulation

Relay contact wiring provided for each set of NO/NC relay contact closure terminals shall be 9 feet of UL Style 1015 CSA TEW 18 AWG wire, same ratings as above, except 16 strands of 18 WG tinned copper.

All necessary hardware for mounting (shelf angles, rack, etc) shall be included in the contract price paid for the BBS, and no additional compensation will be allowed therefor.

Internal mounted battery option

(Allowed only if requested on the plans)

The controller cabinet shall be equipped with a generator twist lock flanged inlet receptable, manual transfer switch and bypass switch.

The twist lock flanged inlet receptacle shall be Hubbell 2615, NEMA L5-30P Twist Lock Flanged Male Inlet Rated for 30A/125VAC or approved equal. Receptacle shall be mounted flush to the cabinet in a weatherproof lift cover plate made of impact-resistant thermoplastic and gray in color.

The bypass switch shall transfer the load, including the UPS to the twist lock inlet receptacle. The manual transfer switch shall be wired to prevent any back feed to the utility service. Both the bypass

switch and manual transfer switch shall be rack mounted independently in the controller cabinet meeting industry standards.

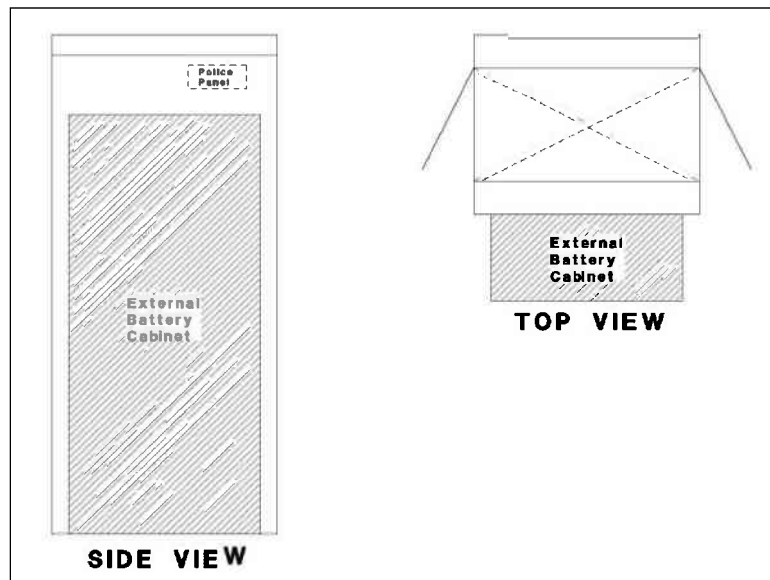
Batteries shall be mounted on swing-tray mounted below the controller shelf. A minimum of six (6) bolts/fasteners shall be used to secure swing-trays to the 332 Cabinet standard EIA 19" rack. All bolts/fasteners and washers shall meet the following requirements:

- Screw type: Pan Head Phillips machine screw
- Size and Thread pitch: 10-32
- Material: 18-8 stainless steel (Type 316 stainless steel is acceptable as an alternate)
- Washer: Use one 18-8 stainless steel flat washer under the head of each 10-32 screw; lock washers are unnecessary provided that the screws are properly tightened.

Number of screws per swivel bracket: minimum six (6) screws per swivel bracket. Screws are to be spaced evenly along bracket, with one screw near each end. Batteries may be shelf mounted in area behind controller so long as shelf and batteries do not interfere with controller unit and C1 plug.

External battery cabinet option

Batteries shall be housed in an external cabinet mounted to the side of the controller cabinet as shown in the following figure or as directed by the Engineer with a minimum of eight (8) bolts:



If BBS is installed at the back of controller cabinet, the modification shall include a minimum of 36 inches wide concrete walkway access to the BBS without encroaching outside the right-of-way. BBS shall be installed at the front of the controller cabinet (in locations where the back of the controller cabinet has limited ROW or conflicting structures and facilities and other obstructions), the BBS cabinet shall not cover the police panel. The BBS cabinet shall also not hinder the access ramp's compliance with ADA requirements.

Four shelves shall be provided within the battery cabinet. There shall be a minimum of 12 inches clearance between shelves. Each shelf shall be a minimum of 9" X 25", and capable of supporting a minimum of 125 lbs. Batteries shall be mounted on individual shelves.

The external battery cabinet shall be NEMA 3R rated in accordance to Section 2-Housings of the Chapter 7 of TEES, for the construction of the cabinet and anodic coating finish.

The external battery cabinet shall be ventilated through the use of louvered vents, filter, and one thermostatically controlled fan in accordance to Section 2-Housings of the Chapter 7 of TEES.

External battery cabinet fan shall be AC operated from the same line output of the Manual Bypass Switch that supplies power to the controller cabinet.

The external battery cabinet shall have a door opening to the entire cabinet. The door shall be attached to the cabinet through the use of a continuous stainless steel piano hinge or four, two-bolts per leaf, hinges in accordance to Section 2-Housings of the Chapter 7 of TEES. The door shall use a three-point, roller locking mechanism and standard #2 key lock to lock the door. The door shall have a stainless steel handle.

The external cabinet shall be equipped with a generator twist lock flanged inlet receptacle, manual transfer switch and bypass switch.

The twist lock flanged inlet receptacle shall be Hubbell 2615, NEMA L5-30P, Twist Lock Flanged Male Inlet Rated for 30A/125V or approved equal. Receptacle shall be mounted flush to the cabinet in a weatherproof lift cover plate made of impact-resistant thermoplastic and gray in color.

The bypass switch shall transfer the load, including the UPS to the twist lock inlet receptacle. The manual transfer switch shall be wired to prevent any back feed to the utility service. Both the bypass switch and manual transfer switch shall be rack mounted independently in BBS cabinet meeting industry standards.

The BBS with external battery cabinet shall come with all bolts, conduits and bushings, gaskets, shelves, and hardware needed for mounting.

Maintenance, Displays, Controls and Diagnostics

The BBS shall include a 2 line by 40 character LCD display to indicate current battery charge status, input/output voltages, time and settings of various conditions. The same parameters shall be available via RS232 or USB interfaces on the face of the BBS.

The BBS shall have lightning surge protection compliant with IEEE/ANSI C.62.41.

The BBS shall be capable of accepting firmware upgrades of the non-volatile, read-only memory via serial port communications. The updates shall be accomplished by uploading the software to the BBS over the RS232 serial port located on the face of the BBS.

The BBS shall be equipped with an integral system to prevent battery from destructive discharge and overcharge.

The BBS shall be capable of performing a SELF-TEST, locally from the BBS front panel LCD, or remotely via RS232 or USB interface. The duration of the SELF-TEST shall be programmable in 1-minute increments from 1 minute to 255 minutes.

The BBS and batteries shall be easily replaced with all needed hardware and shall not require any special tools for installation.

The BBS shall include a re-settable inverter event counter to indicate the number of times the BBS was activated and the total number of hours the unit has operated on battery power, accessible via the LCD screen or remotely via RS232 or USB.

The BBS shall be equipped with an event log that stores for a minimum the last 100 events. The events shall be time and date stamped. The event log shall be retrievable via RS232, USB or from the BBS LCD screen. The event log shall be display and print out in plain English when output the RS232 or USB ports.

Battery System

Individual battery shall be 12V, rated 105 amp-hour for 20 hours @ 77°F to 1.70 VPC, deep cycle, sealed prismatic lead-calcium based Absorbed Glass Mat/ Valve Regulated Lead Acid (AGM/VRLA) battery and shall be easily replaced and commercially available off the shelf.

The manufacturer shall certify batteries to operate over a temperature range of – 25 °C to +74 °C.

The batteries shall be provided with appropriate interconnect wiring and corrosion-resistant mounting trays and/or brackets appropriate for the cabinet into which they will be installed.

Batteries shall indicate maximum recharge data and recharging cycles.

Furnish four (4) batteries for the BBS.

Battery Harness

Battery interconnect wiring shall be via two-part modular harness:

- Part I shall be equipped with red (+) and black (-) cabling that can be permanently connected to the positive and negative posts of each battery. Each red and black pair shall be terminated into a Molex, polarized – keyed battery cable connector or equivalent. The length of the harness between batteries shall be a minimum of 12 inches.
- Part II shall be equipped with the mating Power Pole style connector for the batteries and a single, insulated Power Pole style connection to the inverter/charger unit. Harness shall be fully insulated and constructed to allow batteries to be quickly and easily connected in any order to ensure proper polarity and circuit configuration. The length of the battery interconnect harness shall be a minimum of 60 inches from the Inverter/Charger plug to the first battery in the string.

Power Pole connectors may be either one-piece or two-piece. If a two-piece connector is used, a locking pin shall be used to prevent the connectors from separating.

All battery interconnect harness wiring shall be UL Style 1015 CSA TEW or Welding Style Cable or equivalent, all of proper gauge with respect to design current and with sufficient strand count for flexibility and ease of handling.

Battery terminals shall be covered and insulated with molded boots to prevent accidental shorting.

BBS Quality Assurance

Each Battery Backup System (BBS) shall be manufactured in accordance with a manufacturer Quality Assurance (QA) program. The QA program shall include two Quality Assurance procedures:

1. Design QA - The manufacturer, or an independent testing lab hired by the manufacturer, shall perform Design Qualification Testing on new BBS system(s) offered, and when any major design change has been implemented on an existing design. A major design change is defined as any modification - material, electrical, physical, or theoretical, that changes any performance characteristics of the system, or results in a different circuit configuration. Where a dispute arises in determining if a system is a new design or if the system has had a major design change, the County will make the final determination if Design Qualification Testing is required prior to production consideration.
2. Production QA - The Production QA shall include statistically controlled routine tests to ensure minimum performance levels of BBS units built to meet this specification and a documented process of how problems are to be resolved.

QA process and test results documentation shall be kept on file for a minimum period of seven years.

AA

86-B ELECTRICAL SYSTEMS

Add to section 86-1:

CITY OF MURRIETA - TRAFFIC SIGNAL AND HIGHWAY LIGHTING SYSTEM

THE FOLLOWING TECHNICAL SPECIFICATIONS ARE TO BE USED IN CONJUNCTION WITH THE "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (GREEN BOOK)" UNLESS OTHERWISE NOTED.

A. General

Furnishing and installing traffic signal and highway lighting systems, and payment shall conform to the provisions in Section 86, "Electrical Systems", of the latest edition Standard Specifications, amendments to the Standard Specifications, and these Special Provisions.

B. Start of Work

Location where signalization and highway lighting work is to be performed:

	Location	Area
1.	Clinton Keith Road and Menifee Road ***	City of Murrieta
2.	Clinton Keith Road and Whitewood Road	City of Murrieta

*** Note: Location No. 1 (Clinton Keith Road and Menifee Road) is applicable only if the 4-Lane option is selected for award.

C. Equipment Orders

The Contractor shall furnish all equipments and materials specified in the plans and these special provisions that are not furnished by the County. All equipment shall be new and purchased by the Contractor for this project only.

Submittals and issuance of Notice to Proceed

Within twenty one (21) calendar days after the award of the contract, the Contractor shall submit equipment and materials submittals to the Engineer for review and approval. The Contractor shall allow fourteen (14) calendar days for the Engineer to review the equipment and materials submittals. If revisions are required as determined by the Engineer, the Contractor shall revise and resubmit the equipment and materials submittals within seven (7) calendar days of receipt of the Engineer's comments and shall allow seven (7) working days for the Engineer to review the revisions. Once the submittals are approved by the Engineer, the Contractor must order equipment and materials and then submit a copy of each vendor Equipment and Material Purchase Order within (7) calendar days to the Engineer.

The Contractor must have copies of approved Equipment and Material submittal(s) and Purchase Order(s) prior to the coordination and issuance of the Notice to Proceed. Delay in equipment delivery shall not be considered as justification for the suspension of the construction contract.

Additional Liquidated Damages

In addition to the liquidated damages set forth in Special Provision section "Liquidated Damages" of these contract documents, the Contractor shall pay to the County of Riverside the sum of \$800.00 per day for

each and every calendar day delay in receiving all of the below listed equipment furnished by the Contractor, onto the job site or the Contractor's storage facility, and available for installation, within sixty (60) calendar days of the contract award date:

1. Traffic Signal and Pedestrian Signal heads
2. Service Equipment Enclosures
3. Traffic Signal and Pedestrian Signal heads
4. LED Modules
5. Signal and Lighting Standards and Anchor Bolts

D. Equipment List and Drawings

Equipment list and drawings shall conform to the provisions in Section 86-1.04, "Equipment List and Drawings", of the Standard Specifications and these Special Provisions.

The Contractor shall furnish four complete cabinet wiring diagrams for each furnished controller assembly, battery backup system, video detection system, and emergency vehicle preemption system. The cabinet wiring diagram shall include an approximately 6 inches x 8 inches or larger schematic drawing of the project intersection on a separate 8 ½" x 11" sheet of paper, which shall include the following information, at a minimum:

1. North arrow
2. Street names
3. Pavement delineation and markings
4. Signal poles
5. Traffic signal heads with phase designations
6. Pedestrian signal heads with phase designations
7. Loop detectors with input file designations

E. Warranties, Guaranties, Instruction Sheets, and Manuals

Warranties, guaranties and instruction sheets shall conform to these Special Provisions.

2. LED modules shall have five (5) years of manufacturer warranty.
2. Battery Backup System (BBS) shall have five (5) years of manufacturer warranty. The first three (3) years shall be termed the "Advanced Replacement Program". Under this program, the manufacturer will send out a replacement within two business days of the call notifying them of an issue. The replacement unit may be either a new unit or a re-manufactured unit that is up to the latest revision. The last two years of the warranty will be factory-repair warranty for parts and labor on the BBS.
3. All other equipment and systems shall have at least one (1) year of manufacturer warranty.

Furnish the manufacturer's standard written warranty pertaining to defects in materials and workmanship for all equipment, and two (2) sets of user, operation, and maintenance manuals, written in English, on all equipments and components for the traffic signal and highway lighting system to the Engineer.

F. 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.