

DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES

OFFICE ENGINEER

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May 11, 2012

12-Ora-405-0.3/7.8

12-0M1404

Project ID 1200020300

ACIM-405-2(961)93E

Addendum No. 2

Dear Contractor:

This addendum is being issued to the contract for CONSTRUCTION ON STATE HIGHWAY IN ORANGE COUNTY IN IRVINE AT VARIOUS LOCATIONS FROM IRVINE CENTER DRIVE OVERCROSSING TO MACARTHUR BOULEVARD OVERCROSSING.

Submit bids for this work with the understanding and full consideration of this addendum. The revisions declared in this addendum are an essential part of the contract.

Bids for this work will be opened on Thursday, May 17, 2012.

This addendum is being issued to revise the Project Plans, the Notice to Bidders and Special Provisions, and the Bid book.

Project Plan Sheets 1, 4, 29 and 31 are revised. Copies of the revised sheets are attached for substitution for the like-numbered sheets.

Project Plan Sheets 34A, 47A, 47B and 48A are added. Copies of the added sheets are attached for addition to the project plans.

In the Notice to Bidders and Special Provisions, in the "STANDARD PLANS LIST," the following Standard Plans are added:

"ES-4A, Electrical System (Signal Heads and Mountings)
RSP ES-4C, Electrical System (Signal Heads and Mountings)
RSP ES-4D, Electrical System (Signal Heads and Mountings)
NSP ES-8A, Electrical System (Pull Box)
ES-10, Electrical System (Isofootcandle Diagrams)"

In the Notice to Bidders and Special Provisions, in the "STANDARD PLANS LIST," the following Standard Plan is deleted:

"ES-8, Electrical System (Pull Box Details)"

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In the Special Provisions, Section 4, "BEGINNING OF WORK, TIME OF COMPLETION, AND LIQUIDATED DAMAGES," the first paragraph is revised as follows:

"The 1st working day is the earlier of (1) the 180th day after contract approval or (2) the day you start work other than the measurement of controlling field dimensions or the location of utilities."

In the Special Provisions, Section 4, "BEGINNING OF WORK, TIME OF COMPLETION, AND LIQUIDATED DAMAGES," the fourth paragraph is revised as follows:

"You may start work at the job site before the 180th day after contract approval if:

1. You obtain required approval for each submittal before the 180th day
2. The Engineer authorizes it in writing"

In the Special Provisions, Section 8-1.015, "STATE-FURNISHED MATERIALS," is added after the Section 8-1.01, "PREQUALIFIED AND TESTED SIGNING AND DELINEATION MATERIALS," as attached.

In the Special Provisions, Section 10-1.01, "ORDER OF WORK," the following paragraphs are added after the last paragraph:

"The first order of work shall be to place the order for the electrical equipment and sign panels.
Prior to commencement of the traffic signal functional test at any location, all items of work related to signal control shall be completed and all roadside signs, pavement delineation, and pavement markings shall be in place at that location."

In the Special Provisions, Section 10-1.145, "STEEL STRUCTURES," is added after the Section 10-1.14, "CLEARING AND GRUBBING," as attached.

In the Special Provisions, Section 10-3.01, "DESCRIPTION," is revised as follows:

"Modify signal, modify signal and lighting and maintaining existing traffic management system elements during construction shall conform to the provisions in Section 86, "Electrical Systems," of the Standard Specifications and these special provisions."

In the Special Provisions, Section 10-3.045, "CAST-IN-DRILLED-HOLE CONCRETE PILE FOUNDATION," is added after the Section 10-3.04, "MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION," as attached.

In the Special Provisions, Section 10-3.05, "STANDARD, STEEL PEDESTALS, AND POSTS," the following paragraph is added after the last paragraph.

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

In the Special Provisions, Section 10-3.084, "LIGHT EMITTING DIODE SIGNAL MODULE," is added as attached.

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In the Special Provisions, Section 10-3.085, "STATE-FURNISHED CONTROLLER UNIT," is added after the Section 10-3.08, "CONDUCTORS, CABLES, AND WIRING," as attached.

In the Special Provisions, Section 10-3.09, "LIGHT EMITTING DIODE COUNTDOWN PEDESTRIAN SIGNAL MODULE" is replaced as attached.

In the Special Provisions, Section 10-3.11, "ACCESSIBLE PEDESTRIAN SIGNAL," is added as attached.

In the Special Provisions, Section 10-3.12, "LUMINAIRES," is added as attached.

In the Special Provisions, Section 10-3.13, "REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT," is added as attached.

In the Special Provisions, Section 10-3.14, "PAYMENT," is added as attached.

In the Bid book, in the "Bid Item List," Item 27 is added as attached.

To Bid book holders:

Replace page 4 of the "Bid Item List" in the Bid book with the attached revised page 4 of the Bid Item List. The revised Bid Item List is to be used in the bid.

Inquiries or questions in regard to this addendum must be communicated as a bidder inquiry and must be made as noted in the Notice to Bidders section of the Notice to Bidders and Special Provisions.

Indicate receipt of this addendum by filling in the number of this addendum in the space provided on the signature page of the Bid book.

Submit bids in the Bid book you now possess. Holders who have already mailed their book will be contacted to arrange for the return of their book.

Inform subcontractors and suppliers as necessary.

This addendum and attachments are available for the Contractors' download on the Web site:

http://www.dot.ca.gov/hq/esc/oe/project_ads_addenda/12/12-0M1404

If you are not a Bid book holder, but request a book to bid on this project, you must comply with the requirements of this letter before submitting your bid.

Sincerely,



REBECCA D. HARNAGEL
Chief, Office of Plans, Specifications & Estimates
Office Engineer
Division of Engineering Services

Attachments

8-1.015 STATE-FURNISHED MATERIALS

The State furnishes you with:

- Model 2070L controller unit

10-1.145 STEEL STRUCTURES

Construction of steel structures shall conform to the provisions in Section 55, "Steel Structures," of the Standard Specifications and these special provisions.

Attention is directed to "Welding" in Section 8, "Materials," of these special provisions.

MATERIALS

High-strength fastener assemblies and other bolts attached to structural steel with nuts and washers shall be zinc coated. When direct tension indicators are used in these assemblies, the direct tension indicator and all components of the fastener assembly shall be zinc coated by the mechanical deposition process.

ROTATIONAL CAPACITY TESTING PRIOR TO SHIPMENT TO JOB SITE

Rotational capacity tests shall be performed on all lots of high-strength fastener assemblies prior to shipment of these lots to the project site. Zinc-coated assemblies shall be tested after all fabrication, coating, and lubrication of components has been completed. One hardened washer shall be used under each nut for the tests.

The requirements of this section do not apply to high-strength cap screws or high-strength bolts used for slip base plates. Each combination of bolt production lot, nut lot, and washer lot shall be tested as an assembly.

A rotational capacity lot number shall be assigned to each combination of lots tested. Each shipping unit of fastener assemblies shall be plainly marked with the rotational capacity lot number.

Two fastener assemblies from each rotational capacity lot shall be tested.

The following equipment, procedure, and acceptance criteria shall be used to perform rotational capacity tests on and determine acceptance of ASTM A 325 long bolts. Fasteners are considered to be long bolts when full nut thread engagement can be achieved when installed in a bolt tension measuring device:

A. Long Bolt Test Equipment:

1. Calibrated bolt tension measuring device with adequate tension capacity for the bolts being tested.
2. Calibrated dial or digital torque wrench. Other suitable tools will be required for performing Steps 7 and 8 of the Long Bolt Test Procedure. A torque multiplier may be required for large diameter bolts.
3. Spacer washers or bushings. When spacer washers or bushings are required, they shall have the same inside diameter and equal or larger outside diameter as the appropriate hardened washers conforming to the requirements in ASTM Designation: F 436.
4. Steel beam or member, such as a girder flange or cross frame, to which the bolt tension measuring device will be attached. The device shall be accessible from the ground.

B. Long Bolt Test Procedure:

1. Measure the bolt length. The bolt length is defined as the distance from the end of the threaded portion of the shank to the underside of the bolt head.
2. Install the nut on the bolt so that 3 to 5 full threads of the bolt are located between the bearing face of the nut and the underside of the bolt head. Measure and record the thread stickout of the bolt. Thread stickout is determined by measuring the distance from the outer face of the nut to the end of the threaded portion of the shank.
3. Insert the bolt into the bolt tension measuring device and install the required number of washers, and additional spacers as needed, directly beneath the nut to produce the thread stickout measured in Step 2 of this procedure.

4. Tighten the nut using a hand wrench to a snug-tight condition. The snug tension shall not be less than the Table A value but may exceed the Table A value by a maximum of 2 kips.

Table A

High-Strength Fastener Assembly Tension Values to Approximate Snug-Tight Condition	
Bolt Diameter (inches)	Snug Tension (kips)
1/2	1
5/8	2
3/4	3
7/8	4
1	5
1-1/8	6
1-1/4	7
1-3/8	9
1-1/2	10

5. Match-mark the assembly by placing a heavy reference start line on the face plate of the bolt tension measuring device which aligns with (1) a mark placed on one corner of the nut and (2) a radial line placed across the flat on the end of the bolt or on the exposed portions of the threads of tension control bolts. Place an additional mark on the outside of the socket that overlays the mark on the nut corner such that this mark will be visible while turning the nut. Make an additional mark on the face plate, either 2/3 of a turn, one turn, or 1-1/3 turn clockwise from the heavy reference start line, depending on the bolt length being tested as shown in Table B.

Table B

Required Nut Rotation for Rotational Capacity Tests ^{(a)(b)}	
Bolt Length (measured in Step 1)	Required Rotation (turn)
4 bolt diameters or less	2/3
Greater than 4 bolt diameters but no more than 8 bolt diameters	1
Greater than 8 bolt diameters, but no more than 12 bolt diameters ^(c)	1-1/3

(a) Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance shall be plus or minus 30 degrees; for bolts installed by 2/3 turn and more, the tolerance shall be plus or minus 45 degrees.

(b) Applicable only to connections in which all material within grip of the bolt is steel.

(c) When bolt length exceeds 12 diameters, the required rotation shall be determined by actual tests in a suitable tension device simulating the actual conditions.

6. Turn the nut to achieve the applicable minimum bolt tension value listed in Table C. After reaching this tension, record the moving torque, in foot-pounds, required to turn the nut, and also record the corresponding bolt tension value in pounds. Torque shall be measured with the nut in motion. Calculate the value, T, where $T = [(the\ measured\ tension\ in\ pounds) \times (the\ bolt\ diameter\ in\ inches) / 48]$.

Table C

Minimum Tension Values for High-Strength Fastener Assemblies	
Bolt Diameter (inches)	Minimum Tension (kips)
1/2	12
5/8	19
3/4	28
7/8	39
1	51
1-1/8	56
1-1/4	71
1-3/8	85
1-1/2	103

7. Turn the nut further to increase bolt tension until the rotation listed in Table B is reached. The rotation is measured from the heavy reference line made on the face plate after the bolt was snug-tight. Record this bolt tension.
8. Loosen and remove the nut and examine the threads on both the nut and bolt.

C. Long Bolt Acceptance Criteria:

1. An assembly shall pass the following requirements to be acceptable: (1) the measured moving torque (Step 6) shall be less than or equal to the calculated value, T (Step 6), (2) the bolt tension measured in Step 7 shall be greater than or equal to the applicable turn test tension value listed in Table D, (3) the nut shall be able to be removed from the bolt without signs of thread stripping or galling after the required rotation in Step 7 has been achieved, (4) the bolt does not shear from torsion or fail during the test, and (5) the assembly does not seize before the final rotation in Step 7 is reached. Elongation of the bolt in the threaded region between the bearing face of the nut and the underside of the bolt head is expected and will not be considered a failure. Both fastener assemblies tested from one rotational capacity lot shall pass for the rotational capacity lot to be acceptable.

Table D

Turn Test Tension Values	
Bolt Diameter (inches)	Turn Test Tension (kips)
1/2	14
5/8	22
3/4	32
7/8	45
1	59
1-1/8	64
1-1/4	82
1-3/8	98
1-1/2	118

The following equipment, procedure, and acceptance criteria shall be used to perform rotational capacity tests on and determine acceptance of ASTM A 325 short bolts. Fasteners are considered to be short bolts when full nut thread engagement cannot be achieved when installed in a bolt tension measuring device:

A. Short Bolt Test Equipment:

1. Calibrated dial or digital torque wrench. Other suitable tools will be required for performing Steps 7 and 8 of the Short Bolt Test Procedure. A torque multiplier may be required for large diameter bolts.
2. Spud wrench or equivalent.
3. Spacer washers or bushings. When spacer washers or bushings are required, they shall have the same inside diameter and equal or larger outside diameter as the appropriate hardened washers conforming to the requirements in ASTM Designation: F 436.
4. Steel plate or girder with a hole to install bolt. The hole size shall be 1/16 inch greater than the nominal diameter of the bolt to be tested. The grip length, including any plates, washers, and additional spacers as needed, shall provide the proper number of threads within the grip, as required in Step 2 of the Short Bolt Test Procedure.

B. Short Bolt Test Procedure:

1. Measure the bolt length. The bolt length is defined as the distance from the end of the threaded portion of the shank to the underside of the bolt head.
2. Install the nut on the bolt so that 3 to 5 full threads of the bolt are located between the bearing face of the nut and the underside of the bolt head. Measure and record the thread stickout of the bolt. Thread stickout is determined by measuring the distance from the outer face of the nut to the end of the threaded portion of the shank.
3. Install the bolt into a hole on the plate or girder and install the required number of washers and additional spacers as needed between the bearing face of the nut and the underside of the bolt head to produce the thread stickout measured in Step 2 of this procedure.
4. Tighten the nut using a hand wrench to a snug-tight condition. The snug condition shall be the full manual effort applied to the end of a 12-inch long wrench. This applied torque shall not exceed 20 percent of the maximum allowable torque in Table E.

Table E

Maximum Allowable Torque for High-Strength Fastener Assemblies	
Bolt Diameter (inches)	Torque (ft-lb)
1/2	145
5/8	285
3/4	500
7/8	820
1	1220
1-1/8	1500
1-1/4	2130
1-3/8	2800
1-1/2	3700

5. Match-mark the assembly by placing a heavy reference start line on the steel plate or girder which aligns with (1) a mark placed on one corner of the nut and (2) a radial line placed across the flat on the end of the bolt or on the exposed portions of the threads of tension control bolts. Place an additional mark on the outside of the socket that overlays the mark on the nut corner such that this mark will be visible while turning the nut. Make 2 additional small marks on the steel plate or girder, one 1/3 of a turn and one 2/3 of a turn clockwise from the heavy reference start line on the steel plate or girder.

6. Using the torque wrench, tighten the nut to the rotation value listed in Table F. The rotation is measured from the heavy reference line described in Step 5 made after the bolt was snug-tight. A second wrench shall be used to prevent rotation of the bolt head during tightening. Measure and record the moving torque after this rotation has been reached. The torque shall be measured with the nut in motion.

Table F

Nut Rotation Required for Turn-of-Nut Installation ^{(a),(b)}	
Bolt Length (measured in Step 1)	Required Rotation (turn)
4 bolt diameters or less	1/3

(a) Nut rotation is relative to bolt, regardless of the element (nut or bolt) being turned. For bolts installed by 1/2 turn and less, the tolerance shall be plus or minus 30 degrees.

(b) Applicable only to connections in which all material within grip of the bolt is steel.

7. Tighten the nut further to the 2/3-turn mark as indicated in Table G. The rotation is measured from the heavy reference start line made on the plate or girder when the bolt was snug-tight. Verify that the radial line on the bolt end or on the exposed portions of the threads of tension control bolts is still in alignment with the start line.

Table G

Required Nut Rotation for Rotational Capacity Test	
Bolt Length (measured in Step 1)	Required Rotation (turn)
4 bolt diameters or less	2/3

8. Loosen and remove the nut and examine the threads on both the nut and bolt.

C. Short Bolt Acceptance Criteria:

1. An assembly shall pass the following requirements to be acceptable: (1) the measured moving torque from Step 6 shall be less than or equal to the maximum allowable torque from Table E, (2) the nut shall be able to be removed from the bolt without signs of thread stripping or galling after the required rotation in Step 7 has been achieved, (3) the bolt does not shear from torsion or fail during the test, and (4) the assembly shall not seize before the final rotation in Step 7 is reached. Elongation of the bolt in the threaded region between the bearing face of the nut and the underside of the bolt head will not be considered a failure. Both fastener assemblies tested from one rotational capacity lot shall pass for the rotational capacity lot to be acceptable.

INSTALLATION TENSION TESTING AND ROTATIONAL CAPACITY TESTING AFTER ARRIVAL ON THE JOB SITE

Installation tension tests and rotational capacity tests on high-strength fastener assemblies shall be performed by the Contractor prior to acceptance or installation and after arrival of the fastener assemblies on the project site. Installation tension tests and rotational capacity tests shall be performed at the job site, in the presence of the Engineer, on each rotational capacity lot of fastener assemblies.

The requirements of this section do not apply to high-strength cap screws or high-strength bolts used for slip base plates.

Installation tension tests shall be performed on 3 representative fastener assemblies in conformance with the provisions in Section 8, "Installation," of the RCSC Specification. For short bolts, Section 8.2, "Pretensioned Joints," of the RCSC Specification shall be replaced by the "Pre-Installation Testing Procedures," of the "Structural Bolting Handbook," published by the Steel Structures Technology Center, Incorporated.

The rotational capacity tests shall be performed in conformance with the requirements for rotational capacity tests in "Rotational Capacity Testing Prior to Shipment to Job Site" of these special provisions.

At the Contractor's expense, additional installation tension tests, tests required to determine job inspecting torque, and rotational capacity tests shall be performed by the Contractor on each rotational capacity lot, in the presence of the Engineer, if:

1. Any fastener is not used within 3 months after arrival on the job site,
2. Fasteners are improperly handled, stored, or subjected to inclement weather prior to final tightening,
3. Significant changes are noted in original surface condition of threads, washers, or nut lubricant, or
4. The Contractor's required inspection is not performed within 48 hours after all fasteners in a joint have been tensioned.

Failure of a job-site installation tension test or a rotational capacity test will be cause for rejection of unused fasteners that are part of the rotational capacity lot.

When direct tension indicators are used, installation verification tests shall be performed in conformance with Appendix Section X1.4 of ASTM Designation: F 959, except that bolts shall be initially tensioned to a value 5 percent greater than the minimum required bolt tension.

WELDING

Table 2.2 of AWS D1.5 is superseded by the following table:

Base Metal Thickness of the Thicker Part Joined, inches	Minimum Effective Partial Joint Penetration Groove Weld Size*, inches
Over 1/4 to 1/2 inclusive	3/16
Over 1/2 to 3/4 inclusive	1/4
Over 3/4 to 1-1/2 inclusive	5/16
Over 1-1/2 to 2-1/4 inclusive	3/8
Over 2-1/4 to 6 inclusive	1/2
Over 6	5/8

* Except the weld size need not exceed the thickness of the thinner part

Dimensional details and workmanship for welded joints in tubular and pipe connections shall conform to the provisions in Part A, "Common Requirements of Nontubular and Tubular Connections," and Part D, "Specific Requirements for Tubular Connections," in Section 2 of AWS D1.1.

The requirement of conformance with AWS D1.5 shall not apply to work conforming to Section 56-1, "Overhead Sign Structures," or Section 86-2.04, "Standards, Steel Pedestals and Posts," of the Standard Specifications.

10-3.045 CAST-IN-DRILLED-HOLE CONCRETE PILE FOUNDATIONS

GENERAL

Summary

This work includes constructing cast-in-drilled-hole concrete pile foundations for traffic signal and lighting standards. Comply with Section 86-2.03, "Foundations," of the Standard Specifications.

MATERIALS

Concrete must contain not less than 590 pounds of cementitious material per cubic yard.

CONSTRUCTION

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

1. Placed to final sidewalk grade before the sidewalk is placed
2. Square for the top 4 inches

PAYMENT

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

10-3.084 LIGHT EMITTING DIODE SIGNAL MODULE

GENERAL

Summary

This work includes installing LED signal module. Comply with Section 86, "Electrical Systems," of the Standard Specifications.

Use LED signal module as the light source for the following traffic signal faces:

1. 12-inch section

Submittals

Before shipping LED signal modules to job site, submit the following to the Transportation Laboratory:

1. Delivery form including district number, EA, and contact information
2. List containing all LED signal module serial numbers anticipated for use
3. LED signal modules

Quality Control and Assurance

Module must be one listed on the Pre-Qualified Products List for LED traffic signals at:

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

The State will test LED signal module shipments as specified in ANSI/ASQ Z1.4. Testing will be completed within 30 days of delivery to the Transportation Laboratory. LED signal modules tested or submitted for testing must be representative of typical production units. LED and circular LED signal modules will be tested as specified in California Test 604. Arrow, U-turn, and bicycle LED signal modules will be tested as specified in California Test 3001. All parameters of the specification may be tested on the modules. LEDs must be spread evenly across the module. LED arrow indication must provide the minimum initial luminous intensity listed. Measurements will be performed at the rated operating voltage of 120 V(ac).

Delays resulting from submittal of non-compliant materials do not relieve you from executing the contract within the allotted time. Non-compliant materials will be rejected. You must resubmit new LED for retesting and pick up the failed units within 7 days of notification. You must provide new LED signal modules and allow a minimum of 30 days for the retest. You must pay for all shipping and handling costs related to testing and retesting. Delays resulting from resubmittal and retesting are your responsibility and no extra time will be allowed.

After testing, you must pick up the tested LED signal modules from the Transportation Laboratory and deliver to the job site.

Warranty

The manufacturer must provide a written warranty against defects in materials and workmanship for LED signal modules for a minimum period of 48 months after installation of LED signal modules. Replacement LED signal modules must be provided within 15 days after receipt of failed LED modules at your expense. The State pays for shipping the failed modules to you. All warranty documentation must be submitted to the Engineer before installation. Replacement LED signal modules must be delivered to State Maintenance Electrical Shop at 1808 N. Batavia Street, Orange, CA 92865, Telephone (714) 974-3092.

MATERIALS

Minimum power consumption for LED signal module must be 5 W.

LED signal module must have an operational lifecycle rating of 48 months. During the operational lifecycle, LED signal module must meet all parameters of this specification.

LED signal module must be designed for installation in the door frame of standard traffic signal housing.

LED signal module must:

1. Be 4 pounds maximum weight
2. Be manufactured for 12-inch circular section
3. Be from the same manufacturer
4. Be the same model for each size
5. Be sealed units with:
 - 5.1. 2 color-coded conductors for power connection.
 - 5.2. Printed circuit board and power supply contained inside and complying with Chapter 1, Section 6 of TEES published by the Department.
 - 5.3. Lens that is:
 - 5.3.1. Integral to the units
 - 5.3.2. Convex or flat with a smooth outer surface
 - 5.3.3. Made of UV stabilized plastic or glass, and withstands UV exposure from direct sunlight for 48 months without exhibiting evidence of deterioration
 - 5.4. 1-piece EPDM gasket
6. Include 3-foot long conductors with quick disconnect terminals attached
7. Be sealed in door frames
8. Fit into existing traffic signal section housing and comply with ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads"

Individual LEDs must be wired so catastrophic loss or failure of 1 LED will not result in loss of more than 5 percent of the signal module light output. Failure of an individual LED in a string must not result in loss of entire string or other indication.

No special tools for installation are allowed.

LED signal module must:

1. Be weather tight and connect directly to electrical wiring.
2. Be capable of optical unit replacement.
3. Be a single, self-contained device, ready for installation into traffic signal housing.
4. Have manufacturer's name, trademark, model number, serial number, lot number, month and year of manufacture, and required operating characteristics, including rated voltage, power consumption, and volt-ampere, permanently marked on the back of the module.
5. Have a symbol of module type and color. Symbol must be an inch in diameter. Color must be written out in 0.50 inch high letters next to the symbol.
6. Be AlInGaP technology for red and yellow indications and gallium nitride technology for green indications.
7. Be ultra bright type rated for 100,000 hours of continuous operation from -40 to +74 °C.
8. Have a maximum power consumption as follows:

LED Signal Module Type	Power Consumption Requirements					
	Power Consumption (Watts)					
	Red		Yellow		Green	
	25 °C	74 °C	25 °C	74 °C	25 °C	74 °C
12-inch circular	11	17	22	25	15	15

Lens may be tinted, or may use transparent film or materials with similar characteristics to enhance "ON/OFF" contrasts. Tinting or other materials to enhance "ON/OFF" contrast must not affect chromaticity and must be uniform across the face of the lens.

If polymeric lens is used, surface coating or chemical surface treatment must be applied for front surface abrasion resistance.

Power supply must be integral to the module.

Internal components must be adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Lens and LED signal module material must comply with the ASTM specifications for that material.

Enclosures containing either the power supply or electronic components of LED signal module, except lenses, must be made of UL94VO flame-retardant material.

If a specific mounting orientation is required, the LED signal module must have prominent and permanent vertical markings for accurate indexing and orientation within the signal housing. Markings must include an up arrow, or the word "UP" or "TOP."

LED signal module must meet or exceed the following values when operating at 25 °C:

Minimum Initial Intensities for Circular Indications (cd)

Angle (v,h)	12-inch		
	Red	Yellow	Green
2.5, ±2.5	399	798	798
2.5, ±7.5	295	589	589
2.5, ±12.5	166	333	333
2.5, ±17.5	90	181	181
7.5, ±2.5	266	532	532
7.5, ±7.5	238	475	475
7.5, ±12.5	171	342	342
7.5, ±17.5	105	209	209
7.5, ±22.5	45	90	90
7.5, ±27.5	19	38	38
12.5, ±2.5	59	119	119
12.5, ±7.5	57	114	114
12.5, ±12.5	52	105	105
12.5, ±17.5	40	81	81
12.5, ±22.5	26	52	52
12.5, ±27.5	19	38	38
17.5, ±2.5	26	52	52
17.5, ±7.5	26	52	52
17.5, ±12.5	26	52	52
17.5, ±17.5	26	52	52
17.5, ±22.5	24	48	48
17.5, ±27.5	19	38	38

LED signal module must meet or exceed the following illumination values for 48 months when operating over a temperature range of -40 to + 74 °C. Yellow LED signal module must meet or exceed the following illumination values for 48 months, when operating at 25 °C:

Minimum Maintained Intensities for Circular Indications (cd)

Angle (v,h)	12-inch		
	Red	Yellow	Green
2.5, ±2.5	339	678	678
2.5, ±7.5	251	501	501
2.5, ±12.5	141	283	283
2.5, ±17.5	77	154	154
7.5, ±2.5	226	452	452
7.5, ±7.5	202	404	404
7.5, ±12.5	145	291	291
7.5, ±17.5	89	178	178
7.5, ±22.5	38	77	77
7.5, ±27.5	16	32	32
12.5, ±2.5	50	101	101
12.5, ±7.5	48	97	97
12.5, ±12.5	44	89	89
12.5, ±17.5	34	69	69
12.5, ±22.5	22	44	44
12.5, ±27.5	16	32	32
17.5, ±2.5	22	44	44
17.5, ±7.5	22	44	44
17.5, ±12.5	22	44	44
17.5, ±17.5	22	44	44
17.5, ±22.5	20	41	41
17.5, ±27.5	16	32	32

LED signal module must comply with the following chromaticity requirements for 48 months when operating over a temperature range of -40 to +74 °C.

Chromaticity Standards (CIE Chart)

Red	Y: not greater than 0.308, or less than 0.998 - x
Yellow	Y: not less than 0.411, nor less than 0.995 - x, nor greater than 0.452
Green	Y: not less than 0.506 - 0.519x, nor less than 0.150 + 1.068x, nor more than 0.730 - x

LED signal module must operate:

1. At a frequency of 60 ± 3 Hz, over a voltage range from 95 to 135 V(ac), without perceptible flicker to the unaided eye. Fluctuations of line voltage must have no visible effect on luminous intensity of the indications. Rated voltage for measurements must be 120 V(ac).
2. Compatible with currently used controller assemblies, including solid state load switches, flashers, and conflict monitors. Comply with TEES Chapters 3 and 6. If a 20 mA alternating current or less is applied to the unit, the voltage read across the 2 leads must be 15 V(ac) or less.

Wiring and terminal block must comply with Section 13.02 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads." Electrical connection for each Type 1 LED signal module must be 2 secured, color-coded, 3-foot long, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wires must comply with NEC, rated for service at +105 °C.

LED signal module on-board circuitry must:

1. Include voltage surge protection to withstand high-repetition noise transients. The voltage surge protection must comply with NEMA Standard TS2, Section 2.1.6.
2. Comply with FCC, Title 47, SubPart B, Section 15 regulations for Class A emission limits for electronic noise.

LED signal module must provide a power factor of 0.90 or greater.

Total harmonic distortion from current and voltage induced into an alternating current power line by LED signal module must not exceed 20 percent at an operating temperature of 25 °C.

When power is applied to LED signal module, light emission must occur within 90 ms.

10-3.085 STATE-FURNISHED CONTROLLER UNIT

The Model 2070L controller unit will be State-furnished as provided under "Materials" of these special provisions.

State forces will maintain controller assemblies. The Contractor's responsibility for controller assemblies shall be limited to conforming to the provisions in Section 6-1.02, "State-Furnished Materials," of the Standard Specifications.

10-3.09 LIGHT EMITTING DIODE COUNTDOWN PEDESTRIAN SIGNAL FACE MODULES

GENERAL

Summary

This work includes installing Light Emitting Diode (LED) countdown pedestrian signal face (PSF) module into standard Type A pedestrian signal housing. Comply with Section 86, "Electrical Systems," of the Standard Specifications, TEES and the California MUTCD.

Submittals

Before shipping to job site, submit the LED countdown PSF modules and the following to the Transportation Laboratory:

1. Delivery form including district number, EA, and contact information
2. List containing serial numbers of all LED countdown PSF modules anticipated for use
3. Installation manuals and schematic wiring diagram.
4. Manufacturer's name, trademark, model number, lot number, month and year of manufacture

Submit documentation of manufacturer's production quality assurance testing performed on LED countdown PSF module. The documentation must include test data that conforms to the specified requirements and the following:

1. Luminous intensity as specified in "Photometric Requirements" of these special provisions.
2. Power factor after burn-in.
3. Test current flow measurements in amperes after burn-in. Measured values must conform with design qualification figures and with this specification. The measured ampere values with rated voltage must be recorded –on the product labels.

Failure to submit manufacturer test documentation will be cause for rejection.

Quality Control and Assurance

Module must be one listed on the Pre-Qualified Products List for LED traffic signals at:

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

If the Engineer determines by visual inspection that there is exterior physical damage, assembly anomalies, scratches, abrasions, cracks, chips, discoloration, or other defects to surface of the lens, modules will be rejected.

The State will test LED countdown PSF module shipments as specified in ANSI/ASQ Z1.4. Testing will be completed within 30 days of delivery to the Transportation Laboratory. LED countdown PSF modules submitted for testing must be representative of typical production units. LED countdown PSF modules will be tested as specified in California Test 606. All parameters of the specification may be tested on the modules.

Delays resulting from submittal of non-compliant materials do not relieve you from executing the contract within the allotted time. Non-compliant materials will be rejected. You must resubmit new LED countdown PSF for retesting and pick up the failed units within 7 days of written notification. If the failed materials are not removed within that period, it may be shipped to you at your expense. You must allow 30 days for retesting. You must pay for all shipping and handling costs related to testing and retesting.

After successful testing, you must pick up the tested LED countdown PSF modules from the Transportation Laboratory and deliver to the job site.

Warranty

You must provide a manufacturer's written warranty against defects in materials and workmanship for LED countdown PSF modules for a minimum period of 48 months from the date of successful completion of acceptance testing. Replacement LED countdown PSF modules must be provided within 15 days after receipt of failed modules at no cost to the State, except for the cost of shipping. All warranty documentation must be submitted to the Engineer before installation. Replacement LED countdown PSF modules must be delivered to State Maintenance Electrical Shop at 1808 N. Batavia Street, Orange, CA 92665, Telephone (714) 974-3092.

MATERIALS

LED countdown PSF module must:

1. Be from the same manufacturer.
2. Be installed in standard Type A pedestrian signal housing.
3. Use LED as the light source.
4. Be designed to mount behind or replace face plates of standard Type A housing as specified in ITE publication, Equipment and Material Standards, Chapter 3, "Pedestrian Traffic Control Signal Indications" and the "California MUTCD."
5. Have a minimum power consumption of 10 W for the UPRAISED HAND.
6. Use required color and be ultra bright type rated for 100,000 hours of continuous operation for a temperature range of -40 to +74 °C.
7. Be able to replace signal lamp optical units and PSF.
8. Fit into pedestrian signal section housings without modifications.
9. Be a single, self-contained device, not requiring on-site assembly for installation.
10. Have the following information permanently marked on the back of module:
 - 10.1. Manufacturer's name
 - 10.2. Trademark
 - 10.3. Model number
 - 10.4. Serial number
 - 10.5. Lot number
 - 10.6. Month and year of manufacture
 - 10.7. Required operating characteristics, as follows:
 - 10.7.1. Rated voltage
 - 10.7.2. Power consumption
 - 10.7.3. Volt-ampere (VA)
 - 10.7.4. Power factor
11. Have prominent and permanent vertical markings for accurate indexing and orientation within the signal housing if a specific mounting orientation is required. Markings must include an up arrow, or the word "UP" or "TOP." Marking must be a minimum of 1-inch diameter.

Circuit board and power supply must be contained inside the LED countdown PSF modules. Circuit board must comply with Chapter 1, Section 6 of TEES.

Individual LEDs must be wired so catastrophic loss or failure of 1 LED will not result in loss of more than 5 percent of the PSF module light output. Failure of an individual LED in a string must not result in the loss of entire string or the indication.

LEDs must be evenly distributed in each indication. Do not use outline shape.

No special tools for installation are allowed.

Installation of the LED countdown PSF module into pedestrian signal face must require only removal of lenses, reflectors, lamps, and existing LED modules.

Assembly and manufacturing processes for LED countdown PSF module must assure that all internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Material used for LED countdown PSF module must comply with ASTM D 3935.

Enclosures containing the power supply or electronic components of LED countdown PSF module, except lenses, must be made of UL94VO flame-retardant material.

Each symbol must not be less than 10 inches high and 6.5 inches wide. Uniformity ratio of illuminated symbols must not exceed 4 to 1 between highest and lowest luminance areas. Symbols must comply with ITE publication, Equipment and Material Standards, Chapter 3, "Pedestrian Traffic Control Signal Indications," and the "California MUTCD." For the countdown, the size of the symbol must be 9" high, 7" wide, with a spacing of 1/2" between the two digits per ITE publication.

LED countdown PSF modules must be designed to operate over the specified ambient temperature and voltage range, and be readable (both day and night) at all distances from 10 feet to the full width of the area to be crossed.

LED countdown PSF module must maintain an average luminance value over 48 months of continuous use in signal operation for a temperature range of -40 to +74 °C. In addition, LED countdown PSF modules must meet or exceed the following luminance values upon initial testing at 25 °C.

Luminance Values

PSF module	Luminance
UPRAISED HAND	1,094 FL
WALKING PERSON	1,547 FL

The luminance value of the number indicated in the countdown timer must be in proportion to the luminance of the "UPRAISED HAND", based on a percentage of LED actuation in a given area.

Color output of LED countdown PSF module must comply with chromaticity requirements in Section 5.3 of ITE publication, Equipment and Material Standards, Chapter 3, "Pedestrian Traffic Control Signal Indications."

Measured chromaticity coordinates of LED countdown PSF module must comply with the following chromaticity requirements for 48 months when operating over a temperature range of -40 to +74 °C.

Chromaticity Standards (CIE Chart)

UPRAISED HAND and COUNTDOWN TIMER (portland orange)	Not greater then 0.390, nor less than 0.331, nor less than 0.997-X
WALKING PERSON (lunar white)	X: not less than 0.280, nor greater than 0.320 Y: not less than 1.055*X - 0.0128, nor greater than 1.055*X + 0.0072

LED countdown PSF module maximum power consumption must not exceed the following values:

Power Consumption Requirements

PSF module	Power Consumption @ 24 °C	Power Consumption @ 74 °C
UPRAISED HAND	10.0 W	12.0 W
WALKING PERSON	9.0 W	12.0 W
Two digit COUNTDOWN TIMER	6.0 W	8.0 W

Wiring and terminal block must comply with Section 13.02 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads." The LED countdown PSF module must be supplied with spade lugs and 3 secured, color-coded, 3-foot long, 600 V(ac), 20 AWG minimum stranded jacketed copper wires. Wires must comply with NEC, rated for service at +105 °C.

LED countdown PSF module must operate:

1. At a frequency of 60 ± 3 Hz over a voltage range from 95 to 135 V(ac) without perceptible flicker to the unaided eye. Fluctuations of line voltage must have no visible effect on luminous intensity of the indications. Rated voltage for measurements must be 120 V(ac).
2. Compatible with currently used State controller assemblies including solid state load switches, flashers, and conflict monitors. Comply with TEES Chapters 3 and 6. If a 20 ma alternating current or less is applied to the unit, the voltage read across the 2 leads must be 15 V(ac) or less.
3. Where the control and regulation module must be "smart" to exhibit countdown displays automatically adjusted with the traffic controller programmed intervals.
4. The mode of operation of the module must be the clearance cycle countdown, wherein the display of the number of remaining seconds must begin only at the beginning of the pedestrian change interval. The module will begin counting down when the flashing clearance signal turns on and will countdown to "0" and turn off when the steady "Don't Walk" signal turns on.

LED countdown PSF module on-board circuitry must:

1. Include voltage surge protection to withstand high-repetition noise transients. The voltage surge protection must comply with NEMA Standard TS2, Section 2.1.6.
2. Comply with FCC, Title 47, SubPart B, Section 15 regulations for Class A emission limits for electronic noise.

LED countdown PSF module must provide a power factor of 0.90 or greater.

Total harmonic distortion from current and voltage induced into an alternating current power line by LED countdown PSF module must not exceed 20 percent at an operating temperature of 25 °C.

The LED countdown PSF module circuitry must prevent perceptible light emission to the unaided eye when a voltage, 50 V(ac) or less is applied to the unit.

When power is applied to LED PSF module, light emission must occur within 90 ms.

The "UPRAISED HAND" and "WALKING PERSON" symbol indications must be electrically isolated from each other. Sharing a power supply or interconnect circuitry between the 3 indications is not allowed.

MEASUREMENT AND PAYMENT

Full Compensation for installing LED countdown PSF is included in the contract lump sum price paid for the items of work involved, and no additional compensation will be allowed therefor.

10-3.11 ACCESSIBLE PEDESTRIAN SIGNAL

GENERAL

Summary

This work includes installing accessible pedestrian signal (APS). Comply with Section 86, "Electrical Systems," of the Standard Specifications, the Transportation Electrical Equipment Specifications (TEES), and the California MUTCD.

Definitions

APS: As defined in the California MUTCD.

accessible walk indication: Activated audible and vibrotactile action during the walk interval.

ambient sound: Background sound level in dB at a given location.

ambient sound sensing microphone: Microphone that measures the ambient sound level in dB and automatically adjusts the APS speaker's volume, accordingly.

APS pedestrian push button (APS PPB) assembly: Assembly that connects a pedestrian push button to an APS electronic device to actuate the components of the APS.

audible speech walk message: Audible prerecorded message that communicates to pedestrians which street has the walk interval.

programming mechanism: Device to program the APS operation.

push button information message: Audible prerecorded message actuated when the push button is pressed and the walk interval is not timing.

push button locator tone: As defined in the California MUTCD.

vibrotactile pedestrian device: As defined in the California MUTCD.

Submittals

Submit the APS wiring diagram and product data.

Submit 1 APS user and operator manuals for each signalized location. Manuals must include a master item index that describes the purpose of each manual and brief description to the directory. The index must include an overall description of the APS and its associated equipment and cables with illustrative block diagrams; manufacturer contact information, technical data specification, parts list, part descriptions, and settings. The manuals must include fault diagnostic and repair procedures and procedures for preventative maintenance in order to maintain APS performance parameters.

Before shipping APSs to the job site, submit APSs and the following to the Transportation Laboratory:

1. Delivery form including contract number and contact information
2. List containing all APS serial numbers
3. Manufacturer's name, trademark, model number, lot number, and month and year of manufacture
4. Programming mechanism if not integral to the APS

Submit a record of completed field tests, APS final configuration, audible sound levels and threshold, and a list of all parameter settings.

Quality Control and Assurance

The APS must be compatible with the State-furnished Model 170E/2070L controller assembly.

Power to the APS must be connected to the pedestrian signal section terminal blocks.

The Department will test APSs. Testing will be completed within 30 days of delivery to the Transportation Laboratory.

All functional and dimensional parameters of these specifications may be tested on the APSs.

Noncompliant materials will be rejected. Delays resulting from the submittal of noncompliant materials do not relieve you from executing the contract within the allotted time.

If material is rejected, submit replacement material and allow 30 days for retesting. Retesting period starts when the replacement material is delivered to the test site. You must pay for all retesting costs.

Remove rejected materials within 7 days after written notification of rejection. If the rejected materials are not removed within that period, the materials may be shipped to you at your expense.

You must pay for all shipping, handling and transportation costs related to testing and retesting.

After testing, pick up the compliant APS from the Transportation Laboratory and deliver it to the job site.

Functional Testing

Field tests must be completed twice, when traffic is noisy (e.g. peak traffic hours) and when traffic is quiet (e.g. off peak hours). Notify the Engineer 15 days before testing the APS.

Warranty

Provide a 2-year manufacturer replacement warranty for the APS effective from the date of installation against any defects or failures. All warranty documentation must be submitted to the Engineer before installation.

Replacement parts must be provided within 10 days after receipt of the failed part at no cost to the Department and must be delivered to the Department's Maintenance Electrical Shop at 1808 N. Batavia Street, Orange, CA 92665, Telephone (714) 974-3092.

MATERIALS

The APS PPB assembly must include:

1. PPB actuator with a minimum diameter of 2 inches. The PPB must be rainproof and shockproof in any weather condition. If a mechanical switch is used, the switch must have:
 - 1.1. Operating force of 3.5 lbs
 - 1.2. Maximum pretravel of 5/64 inch
 - 1.3. Minimum overtravel of 1/32 inch
 - 1.4. Differential travel from 0.002 to 0.04 inches
2. Vibrotactile device on the push button or on the APS. The device may be a vibrotactile arrow or other vibrating surface approved by the Engineer.
3. Enclosure with an ambient sound level sensing microphone and weatherproof speaker. A Type B PPB assembly may be substituted with an APS PPB assembly enclosure, but must be less than 7 lb, be less than 16" x 6" x 5", and fit the standard. Maximum diameter of the hole for passage of wiring must not exceed 1.125". Attachment to the pole must be with 2 screws of diameter from 1/4 to 3/8 inch suitable for use in tapped holes. Clear space between any 2 holes in the post must be at least twice the diameter of the larger hole.

The APS speakers and electronic equipment must be installed inside the APS PPB assembly enclosure. Speakers must not interfere with the PPB or its mounting hardware. Speaker grills must be located on the APS PPB assembly enclosure.

Nine No. 20 conductor cable complying with MIL-W-16878D must be used between the APS PPB assembly and the pedestrian signal head. Wiring must comply with Section 13.02 of ITE publication, Equipment and Material Standards, Chapter 2, "Vehicle Traffic Control Signal Heads" and NEC, rated for service at +105 °C.

Electronic switches, a potentiometer, or a handheld device must be used to control and program the volume level and the messaging for the APS. Programming mechanism must be submitted to the Engineer upon successful APS installation.

The APS must:

1. Include a provision to enable and disable the APS operation.
2. Have a failsafe operation. In the event of APS failure, the pedestrian push buttons, when pressed, must activate the pedestrian WALK signal timing.

3. Provide information using:

- 3.1. Audible speech walk message plays when the PPB is pressed. The message must include the name of the street to be crossed associated with that push button. An example of the message is: "Peachtree, "walk" sign is "on" to cross Peachtree." The message must be repeated for the duration of the "walk" interval. The APS must include at least five sound options to be played during the "walk" interval. The Engineer may field select the "walk" sound option. The message must be activated for use from the beginning of the "walk" interval. The message must have a percussive tone consisting of multiple frequencies with a dominant component of 880 Hz. If the tone is selected as the "message" it must repeat 8 to 10 ticks per second.
- 3.2. Push button information message provides the name of the street to be crossed associated with that push button. The message must play when the PPB is pressed. An example of the message is: "Wait to cross Howard at Grand. Wait."
- 3.3. Push button locator tone that clicks or beeps. The locator tone must come from the PPB and repeat at 1 tone per second interval. Each tone has a maximum duration of 0.15 second. The locator tone volume must adjust in response to ambient sound and be audible up to 12 feet from the push button or to the building line, whichever is less.

CONSTRUCTION

Arrange, at your expense, to have a manufacturer's representative qualified to work on APS present whenever the equipment is installed, modified, connected, and reconnected. The APS must not interfere with the State-furnished controller assembly, the signal installation on signal standards, the pedestrian signal heads, or the terminal compartment blocks. The APS electronic control equipment must reside inside the APS PPB assembly and the standard pedestrian signal head.

You are responsible for the compatibility of the components and for making the necessary calibration adjustment to deliver the performance specified. Provide the equipment and hardware required to install, set up, calibrate, and verify the performance of the APS.

TRAINING

Provide a minimum of 4 hours of training by a certified manufacturer's representative for up to 8 Department employees selected by the Engineer. The content of the training must include instruction on how to install, program, adjust, calibrate, and maintain the APS.

Provide materials and equipment for the training. Notify the Engineer 15 days before the training. The time and location of the training must be agreed upon by you and the Engineer and you. If no agreement can be reached, the Engineer will determine the time and location.

MEASUREMENT AND PAYMENT

Full compensation for installing accessible pedestrian signal is included in the contract lump sum price paid for the items of work involved and no separate payment will be made therefor.

10-3.12 LUMINAIRES

Ballasts shall be the lag regulator type.

10-3.13 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT

Salvaged electrical materials shall be hauled to District 12 Maintenance Yard at 1808 N. Batavia St., Orange, CA 92865, Telephone (714) 974-3092 and stockpiled.

The Contractor shall provide the equipment, as necessary, to safely unload and stockpile the material. A minimum notice of 2 business days shall be given prior to delivery.

10-3.14 PAYMENT

Full compensation for hauling and stockpiling electrical materials shall be considered as included in the contract price paid for the item requiring the material to be salvaged and no additional compensation will be allowed therefor.

BID ITEM LIST
12-0M1404

Item No.	Item Code	Item Description	Unit of Measure	Estimated Quantity	Unit Price	Item Total
21	840504	4" THERMOPLASTIC TRAFFIC STRIPE	LF	32		
22	840506	8" THERMOPLASTIC TRAFFIC STRIPE	LF	410		
23	840515	THERMOPLASTIC PAVEMENT MARKING	SQFT	1,580		
24	850111	PAVEMENT MARKER (RETROREFLECTIVE)	EA	44		
25	860090	MAINTAINING EXISTING TRAFFIC MANAGEMENT SYSTEM ELEMENTS DURING CONSTRUCTION	LS	LUMP SUM	LUMP SUM	
26	861502	MODIFY SIGNAL	LS	LUMP SUM	LUMP SUM	
27	861501	MODIFY SIGNAL AND LIGHTING	LS	LUMP SUM	LUMP SUM	

TOTAL BID:

\$ _____