

**MENDOCINO-LAKE COMMUNITY
COLLEGE DISTRICT**

**NORTH STATE STREET AT HENSLEY
CREEK ROAD INTERSECTION
IMPROVEMENTS PROJECT**



TECHNICAL SPECIFICATIONS

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The Technical Specifications consist of the 2018 Caltrans Standard Specifications, as revised by the latest Revised Standard Specifications (dated 05-31-2018), and as modified by the following special provisions.

The Revised Standard Specifications can be downloaded at:
<http://www.dot.ca.gov/des/oe/construction-contract-standards.html>

The work embraced herein shall be done in accordance with the Contract Documents: these special provisions, the project plans, the California Department of Transportation Standard Specifications dated 2018 (as revised) and Standard Plans and Revised Standard Plans dated 2018, and the County of Mendocino Road and Development Standards

The County of Mendocino Road and Development Standards can be downloaded at:
<https://www.mendocinocounty.org/government/transportation/road-standards>

Each special provision begins with a revision clause that describes or introduces a revision to the Standard Specifications. A reference to a Standard Specification heading is only made when modifying the section and is not a comprehensive listing of the sections which apply to the project. All sections apply to the project. Sections which are not deleted, added, or modified by the special provisions remain as written. Any modification to a section does not change the rest of the section. Any paragraph added or deleted by a revision clause does not change the paragraph numbering of the Standard Specifications for any other reference to a paragraph of the Standard Specifications.

Any reference to a State Agency or officer shall be interpreted as if the corresponding County of Mendocino agency officer acting under this contract were so specified.

Any reference to contact information for the State shall be interpreted as if the corresponding Mendocino-Lake Community College District contact information were so specified. Should there be any question as to what the corresponding information would be, contact the Mendocino-Lake Community College District for determination.

DISCREPANCIES AND OMISSIONS

Any discrepancies or omissions found in the Contract Documents shall be reported to the Engineer immediately. The Engineer will clarify discrepancies or omissions, in writing, within a reasonable time.

In resolving inconsistencies among two or more sections of the Contract Documents, precedence shall be given in the following order:

1. Special Provisions
2. Drawings
3. County of Mendocino Road and Development Standards
4. City of Roseville Improvement Standards
5. City of Roseville Standard Construction Specifications
6. Caltrans Standard Specifications and Plans (2018)
7. CA MUTCD (2014)

Addenda shall take precedence over all sections referenced therein. Figure dimensions on Drawings shall take precedence over scale dimensions. Detailed Drawings shall take precedence over general Drawings.

AA

DIVISION I GENERAL PROVISIONS

AA

5 CONTROL OF WORK

Add to section **5-1.20B(1)**:

The work is located within the right-of-way of the County of Mendocino.

You must acquire and comply with encroachments permits, and any applicable building permits, from the County of Mendocino to perform your work. Pay all fees associated with acquiring these permits. Familiarize yourself with each the County's requirements prior to bidding.

Requirements include, but are not limited to:

1. Acquire a business license from the County of Mendocino
2. \$500 miscellaneous fee, check made payable to Mendocino County Department of Transportation or MCDOT.
3. Proof of Insurance of Contractor, also naming Mendocino County as additionally insured in the amount of \$1,000,000 in general liability per incident
4. Water Pollution Control Plan
5. Traffic Control Plans during construction

The County of Mendocino's encroachment permit information is located at:

<https://www.mendocinocounty.org/government/transportation/dot-permits-applications>

Coordinate with Justin Brandt, Engineer for the Mendocino County Department of Transportation, Permits. Mr. Brandt's contact info is:

340 Lake Mendocino Drive
 Ukiah, CA 95482
 (707) 234-2824
brandtj@mendocinocounty.org

Coordinate and comply with the County of Mendocino's requirements, including, but not limited to, hours of work and traffic control.

Payment for all work associated with acquiring County encroachment permits, building permits, and business licenses, including payment of all fees, and complying with the requirements of the permits and licenses, is considered as included in the price paid for the various contract bid items and there will be no separate payment.

Add to section **5-1.27A General**:

Make a record of changes during construction on one set of prints of the plans and specifications provided by the Engineer for this purpose. This set of documents shall be kept at the job site and

9 PAYMENT

9-1.01 COST BREAK-DOWN

The Contractor shall furnish to the Engineer a cost break-down for each contract lump sum item of work described in all applicable Sections as part of this Project. There shall be five lump sum bid items for this Project:

Bid Item No. 1: Mobilization

Bid Item No. 2: Temporary Traffic Control

Bid Item No. 3: Storm Water Pollution Control

Bid Item No. 4: Traffic Signal Improvements

Bid Item No. 5: Signing and Striping Improvements

All work shown in the Plans for the new traffic signal installation at N. State Street and Hensley Creek Road shall be included in Bid Item No. 4.

All work shown in the Plans for the removal, replacement, and installation of signage, striping, and pavement markings shall be included in Bid Item No. 5.

The Contractor shall determine the quantities required to complete the work shown on the plans. The quantities and values shall be included in the cost break-down submitted to the Engineer. The Contractor shall be responsible for the accuracy of the quantities and values used in the cost break-down submitted.

No adjustment in compensation will be made in the contract lump sum prices paid for the various electrical work items due to any differences between the quantities shown in the cost break-down furnished by the Contractor and the quantities required to complete the work as shown on the plans and as specified in these special provisions.

The sum of the amounts for the units of work listed in the cost break-down for electrical work shall be equal to the contract lump sum price bid for the work. Overhead, profit, and labor shall be included in each individual unit listed in the cost break-down.

The cost break-down shall be submitted to the Engineer within 15 days of the Notice to Proceed. The cost breakdown shall be approved, in writing, by the Engineer before any partial payment for the items of work will be made.

At the Engineer's discretion the approved cost break-down may be used to determine partial payments during the progress of the work and as the basis of calculating the adjustment in compensation for the item or items of electrical work due to changes ordered by the Engineer. When an ordered change increases or decreases the quantities of an approved cost break-down, the adjustment in compensation may be determined at the Engineer's discretion in the same manner specified for increases and decreases in the quantity of a contract item of work in accordance with Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.

The cost break-down for Bid Item No.4, as a minimum, shall include the following items when applicable:

86 GENERAL

SECTION 86. SIGNALS, LIGHTING, AND ELECTRICAL SYSTEMS

In addition to Section 86 of Standard Specifications, the following applies:

1.01 DESCRIPTION. The work consists of furnishing and installing traffic signals and safety lighting at the intersection of N. State Street and Hensley Creek Road. Work shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the State Standard Specifications, the County of Mendocino Road and Development Standards, and these Technical Specifications.

1.02 EQUIPMENT LIST AND DRAWINGS. The Contractor shall provide the Engineer with a copy of all purchase orders for equipment and materials used in reference to traffic signals within five days of when such orders are placed. The Contractor shall also provide copies of all correspondence with equipment and materials suppliers concerning availability, delivery dates, anticipated delays, and shipment notices within five days of each letter. References to costs may be omitted. Consideration for recommending time extensions for materials and equipment delivery delays will not be made unless these provisions are met.

The Contractor shall furnish two maintenance and operation manuals for all cabinets, controller units, auxiliary equipment, and any other auxiliary equipment furnished.

1.03 ORDER OF WORK. The Contractor shall be responsible for locating and marking the positions of all signal standards and pull boxes. The Engineer may assist the Contractor in locating the above items. The Contractor shall coordinate the layout with the utility company representatives to avoid utility conflicts.

Full compensation for locating and marking the positions of the signal standards and pull boxes, shall be considered as included in the contract lump sum price paid for Traffic Signal Improvements and no additional compensation will be allowed therefor. The Contractor shall remove existing stop signs and pavement legends only after signal turn on.

1.04 FOUNDATIONS. Foundations shall conform to the requirements of Section 86-2 "Foundations" of the State specifications except as modified herein.

The controller and service bases shall be located as shown on the plans within the new Portland Cement Concrete (PCC) pad area. The controller base, service base, and necessary pull boxes shall be located within the new PCC pad area prior to installing the new PCC pad. Pull boxes shall be adjusted to match the finished grade of the new PCC pad.

1.05 STANDARDS. STEEL PEDESTALS AND POSTS. All signal standards shall have a minimum of 2 inches and a maximum of 4 inches of grout installed between the bottom of the base plate and the finished grade.

1.06 CONDUIT. Conduit to be installed underground shall be the rigid non-metallic type, Schedule 40. All conduits shall enter a pull box with a "sweep" 90-degree elbow unless permitted otherwise by the Engineer. All conduits shall have a 1/4-inch pull rope installed in them.

After conductors have been installed, the ends of conduits terminating in pull boxes and controller cabinets shall be sealed with a sealing compound approved by the Engineer.

Insulated bonding bushings will be required on metal conduit. Bushings are required on all new PVC conduits.

All pull boxes shall be located out of waterways/drainageways at the locations shown on the plans, and as approved by the Engineer.

When rigid non-metallic conduit is placed in a trench (not under pavement) after the bedding material is placed and conduit installed, the trench shall be backfilled with twelve inches (12") of backfill material and red warning tape shall be placed on top of the backfill before the trench is completely backfilled.

Existing conduit, to be used or reused, shall be cleaned out by pulling a mandrill of appropriate size through the conduit run and then the conduit run shall be blown out using compressed air. No conductors shall be pulled into existing conduit until the existing conduit is cleaned out.

TRENCHING INSTALLATION OF CONDUIT - Conduit shall be installed in a trench approximately 6 inches in width. The top of the installed conduit shall be a minimum 36 inches below finish grade. Aggregate base shall be used for backfill and compacted to 95%.

The outline of all areas of pavement to be removed shall be cut to a minimum depth of 3 inches with a rock cutting saw specifically designed for this purpose. Cuts shall be neat and true with no shatter outside the removal area

The conduit shall be placed in the bottom of the trench and the trench shall be backfilled with sand to a minimum of 3 inches of cover over the top of the pipe. The remainder of the trench shall be backfilled to the bottom of the pavement layer with 3/4-inch Class 2 aggregate base that meets the requirements of Section 26 of the State Standard Specifications. The remainder of the trench shall be paved with 1/2-inch Type B asphalt concrete to match existing asphalt grades, unless otherwise specifically shown on the plans. Asphalt section shall be a minimum of 4-inches thick. Prior to spreading asphalt concrete, paint binder shall be applied as specified in Section 394.02, "Prime Coat and Paint Binder," of the State Standard Specifications. Spreading and compacting of asphalt concrete shall be performed by any method that will produce an asphalt concrete surfacing of uniform smoothness, texture, and density. A vibrating steel wheel roller is the suggested method to provide a long-lasting asphalt trench pavement.

All excavated areas in the pavement shall be backfilled, except for the top 0.10 foot, by the end of each work period. A temporary cold mix asphalt trench patch is required until final paving is placed.

All trenches shall be paved within 24 hours of the installation of the aggregate base backfill.

1.07 PULL BOXES - Grout shall not be placed in the bottom of pull boxes. Pull box sumps shall be constructed from 1-1/2" minimum clean crushed rock.

Recesses for suspension of ballasts will not be required.

All pull boxes shall be labeled "TRAFFIC SIGNAL" except that the pull box at the PG&E service point shall be labeled "ELECTRIC" or "PG&E".

1.08 CONDUCTORS AND WIRING - At least 6 feet of slack shall be provided in the pull box nearest each signal standard, for those conductors running to that standard; and 3 feet of slack shall be provided in each conductor in all other pull boxes. The wire bundle entering the controller cabinet shall be coiled in the bottom of the cabinet to obtain as much slack as possible.

Straight splices in signal neutral and multiple lighting conductors shall be insulated in conformance with Method B. Tap splices in signal neutral and multiple lighting conductors shall be Type C, and conductors shall be spliced using C-shaped compression connectors; as shown on State Standard Plan ES-13.

Identification bands shall be constructed from a nylon cable tie with a 3/8-inch by 3/4-inch label flag attached. The marking pen shall be one recommended by the manufacturer of the cable tie or it shall be indelible marking pen compatible with writing on the nylon material approved by the Engineer. No other method of labeling will be acceptable. All phase conductors and detector cables shall be labeled by phase designations in the pull box nearest their termination, and in the controller cabinet. Phase conductors shall be labeled with phase designation. Detector cables shall be labeled with phase and loop number. Lighting conductors shall be labeled as appropriate. Spare conductors need not be labeled.

The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer in accordance with the provisions of Section 6-1.07, "Certificates of Compliance," of the State Standard Specifications for the conductors and cables furnished for the project.

Conductors shall not be pulled into conduits until the pull boxes have been set to grade, crushed rock sumps have been installed, and conduits have been bonded and grounded. All pull boxes shall be inspected and approved prior to pulling any conductors. Conductors shall not be pulled into conduits unless the Engineer or Inspector is present to observe the operation. The ends of all unused cables shall be sealed.

1.09 BONDING AND GROUNDING - Anchor bolts for Type 1-B standards shall be bonded together and to the metallic conduit or to the bonding conductor in a non-metallic conduit. Type 3/16 inch or larger bolt will not be required for the Type 1-B standards. Bonding shall be inspected and approved by the Inspector or Engineer prior to placing foundation concrete.

1.10 FUNCTIONAL TESTING - The manufacturer of the controller system, "Model 170E Controller Assembly," of these Special Provisions, shall certify to the Agency that the "system" has been thoroughly bench and operationally tested, and that as a controller system, all components are operating in conformance with these Technical Specifications.

A functional test of the signal system shall be performed, consisting of not less than five continuous days of satisfactory operation.

The maintenance and repair agreement period for furnished equipment shall not commence until the controllers, cabinets, and auxiliary equipment have been installed at the project sites, placed in operation by a factory representative, and the project accepted as complete.

Any damage to new facilities, prior to the "five-day functional test", shall be repaired by the Contractor at his expense. Damage that occurs during the "five-day functional test" shall be repaired by the Agency. After successful completion of the five-day test, the County may relieve the Contractor of operational maintenance for the signal. Maintenance by the County will not relieve the Contractor of repairing any deficiency found prior to the acceptance of the contract.

All costs involved in complying with this section shall be considered included in the contract lump sum price paid for Traffic Signal Improvements, and no additional compensation will be allowed therefor.

1.11 SERVICE - Energy for traffic signals shall be metered. Energy for highway lighting shall not be metered.

The Contractor shall furnish and install the Type III-AF Service Equipment Enclosure for switchgear as shown on the signal plans and as provided in the State Standard Specifications, and these Technical Specifications.

Service cabinet shall conform to the following:

1. Provide one (1) mercury contactor for street lighting.
2. The service enclosure shall have an integral, Type V PEU and circuit to operate the mercury contactor and shall have a single test switch.
3. The cabinet shall be constructed from stainless steel. The interior may be constructed from cold rolled galvanized steel.
4. A copy of the service cabinet wiring diagram shall be furnished to the Engineer for approval prior to fabrication of the cabinet.
5. The meter enclosure shall be provided with factory installed bypass facilities as required by the serving utility.
6. The exterior dimensions of the cabinet shall not exceed 65 inches high, 13 inches wide and 9 inches deep.
7. All interior bussing shall be copper.
8. All exterior seams shall be welded.
9. "POP RIVETS" shall not be used for assembly of the exterior of the cabinet. "POP RIVETS", bolts, or nuts shall not be visible from the exterior.
10. The "main breaker" shall be a 100 amp, two-pole breaker.
11. The luminaire termination point shall be capable of holding up to four conductors.
12. The serving utility terminations shall be in the meter area.
13. All interior labeling shall be by the phenolic labeling method, fastened with stainless steel screws. Wiring shall be labeled with permanent clip sleeve wire markers. Felt, pencil, or stick back markers are not acceptable.
14. The Lexan window shall be no less than 1/4 inch thick and shall be sealed.
15. All circuit breakers shall be installed in a vertical position.
16. The service neutral shall be terminated in the customer area of the cabinet.
17. All hinges shall be continuous stainless-steel piano types.
18. Items 1 through 8 and 15 through 17 shall be furnished as shown on State Standard Plan Sheet ES-2D. One spare 50 A, 120 V, 1P, CB shall be provided for monument sign power and one spare 30 A, 120 V, 1P, CB shall be provided for monument sign lighting. The luminaire lighting circuits shall be 120 Volt; appropriate contactor shall be provided.

The neutral conductor shall run from the service equipment enclosure to the controller cabinet without splicing to any other neutral conductor.

The Contractor shall pay all required utility fees and costs related to providing electric service connections at the site of the work.

In lieu of the provisions in the last paragraph in State Standard Specifications Section 862.11, "Service," labor and materials costs for the entire service conduit connection from the service cabinet or controller cabinet to the service location of the serving utility company shall be considered as included in the contract lump sum price paid for Traffic Signal Improvements, and no additional compensation will be allowed therefor.

1.12 MODEL 170E CONTROLLER ASSEMBLY - Model 170E Controller Assembly components shall conform to the State of California Business and Transportation Agency, Department of Transportation Specifications for Traffic Signal Control Equipment dated January 1989, and all current addenda. It shall also meet the requirements of AB3418 and be NTCIP compliant.

Contractor shall provide for the following:

1. All convenience receptacles shall be Ground Fault Interrupter (GFI) type.
2. All labeling shall be either silk screen or phenolic/engraved.
3. All circuit breakers shall have the rating engraved into the handle.
4. EPROM socket U3 of the 412C shall be of the "0" insertion force type, i.e. the EPROM chips shall be installed or removed without the use of tools.
5. Provide dual ACIA's on all Model 170 Controllers, for two- way communications.
6. Dual ACIA's shall be integral to the controller unit.
7. All Model 170 Controller boards shall be of the "vertical mount" type, horizontal mount boards are NOT ACCEPTABLE.
8. The PDA and the Cabinet Power Supply shall be combined into one unit. Unit shall be currently approved by CALTRANS.
9. Controller cabinet shall be provided with dual exhaust fans.

COMPONENTS OF THE MODEL 170E CONTROLLER ASSEMBLY

The Contractor shall furnish all signal control equipment necessary to accomplish all functions at this intersection as shown on the plans.

An additional set of controller shelves shall be installed in the cabinet. Shelf shall be full width in the rack.

The Model 170E Controller and controller cabinet shall form a complete functional controller system capable of providing the traffic signal operation specified. Controller shall be provided with a restart switch installed on the inside of the controller unit (not on front panel). All traffic control equipment to be furnished shall be currently acceptable to the CALTRANS Laboratory, Sacramento, CA, and shall be currently listed on the Department of Transportation "QPL" lists.

A digital I/O Wraparound Connector for C1, and a Communications Wraparound Connector for C2 shall be furnished for each controller. Diagnostics shall be furnished for each System Memory Module. The system memory modules shall provide for 32K EPROM, 4K RAM, and by switch selection using 2764, 27128, or 27256 EPROMS and shall be battery backed up using a 30-day lithium battery. EPROM's for use in the System Memory Modules shall have a maximum rating of 250 ns.

The Contractor shall arrange to have a signal technician, qualified to work on the controller unit and employed by the controller unit manufacturer or his representative, present at the project site at the time the equipment is activated.

CONTROLLER CABINET

Attention is directed to the provisions in Section 86.2.11, "Model 170 Controller Assembly," and these Special Provisions. Field wiring terminal strips shall be capable of accepting up to four (4) conductors for each phase.

The Model 332L Controller Cabinet shall be constructed from **stainless steel and shall have rollout shelves.**

1.13 VEHICLE SIGNAL FACES AND SIGNAL HEADS - Terminal compartments, MAS mounts, slip fitters and curved washers shall be bronze. Signal indications shall be furnished and installed by the Contractor.

All traffic signal heads, backplates, visors and frameworks shall be "factory powder coat" painted in lieu of conventional painting. All signal heads shall be factory assembled with their respective

frameworks and tagged by location and intersection. Signal heads and frameworks, as a unit, shall be installed by the Contractor's workmen at the job site. Extreme care shall be taken by the Contractor's workers during the installation of the signals, frameworks and heads. Any scar marks, or cosmetic damage to the equipment caused from tools or installation processes shall be cause for rejection.

The Contractor shall exercise care at the time the signal heads are installed to ensure that the gaskets provided for the mounting of the heads are installed on the outside of the housing to provide a watertight seal. Gaskets shall not be placed on the inside of the housing.

ALL vehicle signal indications shall be 12-inch, light emitting diodes (LED's) and **ALL** pedestrian signals shall be LED's. All signal head housings shall be the metallic type.

The manufacturer's name, trademark serial number and other necessary identification shall be permanently marked on the backside of the LED signal module. A label shall be placed on the LED signal module certifying compliance to this specification.

The LED signal module shall be a single, self-contained device, not requiring on-site assembly for installation into an existing traffic signal housing.

The assembly and manufacturing process for the LED signal assembly shall be such as to assure all internal LED and electronic components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.

Each red LED signal module shall comprise a smooth surfaced red UV stabilized polycarbonate outer shell. Each amber LED signal module shall comprise a smooth surfaced amber UV stabilized polycarbonate outer shell. All green LED signal modules shall comprise a smooth surfaced clear UV stabilized polycarbonate outer shell. All LED signal modules shall have multiple LED light sources, a regulated power supply and a polycarbonate back cover assembled in a silicon sealed unit. LED's are to be mounted on a polycarbonate positioning plate. A mechanical alignment and assembly mechanism must ensure that each LED is retained in pre-determined position. The light distribution of each LED should be maximized by an internal beam controlling optical faceted lens.

Each module shall incorporate a regulated power supply engineered to electrically protect the LED's and maintain a safe reliable operation. The power supply shall provide capacitor filtered DC regulated current to the LED's as per the LED's manufacturer's specification. The module shall meet UL No. 1012 and/or CSA C22.2 No. 205 standards.

The LED signal module shall operate from a 60 Hz AC line voltage ranging from 89 Volts RMS to 135 Volts RMS. Nominal rated voltage for all measurements shall be 117 Volts RMS. The circuitry shall prevent flicker over this voltage range.

Maximum wattage for 12" ball indications shall not be more than 20 watts and 10 watts for 12" arrow indications.

The LED signal modules shall be operationally compatible with currently used controllers and conflict monitors.

The LED signal modules shall be rated for use in the ambient operating temperature range of 40°C(-40°F) to +74°C(+165°F).

The LED signal modules shall be dust and moisture tight to protect all internal LED and electrical components.

LED signal indications shall be currently listed on the Department of Transportation "QPL" lists.

All LED signal indications shall be warranted for a period of five (5) years from the date of "official turn-on" of the complete signal system.

1.14 PEDESTRIAN SIGNALS - Pedestrian signals shall consist of Light Emitting Diodes (LED's). Pedestrian signal indications shall be furnished and installed by the Contractor.

The LED signal module shall be comprised of multiple LED light sources, a regulated power supply and a polycarbonate back cover assembled in a silicon sealed unit. LED's are to be mounted on a polycarbonate positioning plate. A mechanical alignment and assembly mechanism must ensure that each LED is retained in pre-determined position.

Each module shall incorporate a regulated power supply engineered to electrically protect the LED's and maintain a safe reliable operation. The power supply shall provide capacitor filtered DC regulated current to the LED's as per the LED's manufacturer's specification. The module shall meet UL No. 1012 and/or CSA C22.2 No. 205 standards.

All pedestrian heads, visors and frameworks shall be "factory powder coat" painted in lieu of conventional painting.

All heads shall be factory assembled with their respective frameworks and tagged by location and intersection. Pedestrian heads and frameworks, as a unit, shall be installed by the Contractor's workmen at the job site. Extreme care shall be taken by the Contractor's workers during the installation of the signals, frameworks and heads. Any scar marks, or cosmetic damage to the equipment caused from tools or installation processes shall be cause for rejection.

Gaskets for mounting of pedestrian signal heads shall be installed on the outside of the housing to provide a watertight seal, and the Contractor shall take extra care to ensure that the gaskets are properly installed.

All LED signal indications shall be warranted for a period of five (5) years from the date of "official turn-on" of the complete signal system.

1.15 ACCESSIBLE PEDESTRIAN SIGNALS - Accessible Pedestrian Push Buttons system must comply with the California MUTCD, chapter 4E. The system shall comply with the following requirements:

- NEMA, 250-Type 4X (Enclosure).
 - TS4 (Electrical Reliability in section 8).
 - IEC 61000-4-4 and IEC 61000-4-5 (Transient Suppression).
 - FCC Title 47, Part 15, Class A (Electronic Noise).
 - NEMA TS2 Section 2.1.
 - Weigh less than 5 lb.
 - Have an internal weatherproof speaker and microphone that senses the ambient sound level.
 - Adjustable operating force between 1lb and 3 lb.
 - Minimum 2-inch diameter actuator.
- A. The housing for the unit shall be 9"x12" (green) and made of 356 Aluminum heat-treated to meet Specification T-6. It shall be of a telescoping, vandal-proof design. The color shall be Olive Green. The APS shall be installed right side up to avoid water penetration.
- B. The system includes a Control Unit (CU) inside each pedestrian signal indications housing powered by 120 VAC WALK/DON'T WALK pedestrian head lamp indications,

an interface panel. Each APS shall connect to a control unit located inside its associated pedestrian signal housing. The APS shall provide information and cues via both a vibrating arrow button and audible message indicating the” **WALK SIGN IS ON**”, during WALK interval. A sunlight visible red LED latches “ON” to confirm the button has been pushed. The APS shall include frame, sign, ADA compliant push button, and mounting hardware.

- C. Mounting Height and Location. APS push buttons shall be located no more than 5 feet offset from the extended crosswalk line, at a height of 42 inches above the sidewalk surface. Push Button Frame Extender (PBFE) shall be installed per plan.

Push Button Frame Extender (PBFE) - Push button frame extender shall be installed where shown on plans. PBFE shall extend APS 12” from pole. The PBFE shall be the MPS Extension Bracket, manufactured by Campbell Company, iN-EXT-12 Mounting Extender, manufactured by Polara Enterprises, or approved equivalent.

1.16 VIDEO DETECTION SYSTEM – The video detection system shall be the Gridsmart System, manufactured by Gridsmart Technologies, Inc. The Contractor shall furnish and install all required components to provide a functional system capable of detecting vehicles and bicycles as required per plan.

System Hardware

The required hardware shall include the following:

- One Video Image Vehicle Tracking and Detection System (VIVTDS) processor capable of connecting with 1 to 8 sensors
- One fisheye VIVTDS sensor for omnidirectional viewing of the intersection.
- One 1.5” straight-thread, swivel bracket, and surge protector junction unit
- One surge protector junction unit
- One mounting pole and bracket (90° pole)
- One Ethernet Protection Module (surge protector located in the traffic cabinet)
- VIVTDS interface cables to the traffic signal controller based on model/type.

Sensor Hardware

Fisheye Sensor

The VIVTDS should have one downward-facing fisheye sensor capable of seeing the center of the intersection and have an omnidirectional line of site to track vehicles entering and exiting the intersection. Other required features shall include the following:

- Color images outputted into digital format as MJPEG images
- Horizontal resolution of at least 2560 lines and vertical resolution of at least 1920 lines.
- A five (5) megapixel CMOS camera with an active-pixel sensor (APS)
- Camera lens shall not require adjustment and is always in focus
- A thermostatically controlled heater residing inside the enclosure to reduce the effects of ice and condensation
- Any plastics used in the enclosure shall have ultraviolet inhibitors
- A waterproof and dust tight aluminum enclosure

The sensor dimensions excluding connectors shall not exceed 9.9” x 7.9” (height x diameter). The weight of the sensor including the enclosure shall not exceed eight 8 lbs. The VIVTDS sensor manufacturer shall provide a lifetime “always in focus” guarantee on the fisheye camera.

Processor Hardware

The VIVTDS processor shall support 1 or 2 fisheye sensors, or if equipped with 1 fisheye sensor the VIVTDS processor should, at a minimum, be capable of simultaneously supporting up to four (4)

additional VIVTDS sensors for special requirements such as advance detection or underpass detection.

The VIVTDS processor shall comply with NEMA standards, TS-1 Type 1, and 2; TS-2; 170/2070; and ITS.

The VIVTDS processor will have at a minimum four (4) USB 3.0 ports for expansion flexibility and have a built-in modem. The VIVTDS processor shall be no more than 1U high with dimensions, excluding connectors, not to exceed 8.5" x 11.5" x 1.75" and weigh no more than 5.2 lbs. The unit shall have flexible mounting options including the ability to lie flat on a cabinet shelf, be mounted in a standard traffic cabinet rack with optional mounting ears, or be installed vertically with optional base. The outer enclosure shall be a powdered coated aluminum.

1.17 BATTERY BACK-UP SYSTEM – The battery back-up system (BBS) shall be installed in a "backpack" cabinet mounted to the right side of the 332L controller cabinet. The BBS cabinet shall be per Standard Specification 86-1.02Q(5) and 87-1.03D Battery Backup System Cabinets.

The BBS shall be designed for outdoor applications in accordance with the Caltrans Transportation Electrical Equipment Specifications (TEES), dated March 12, 2009, Chapter 1 requirements.

Battery Backup System Configuration

The Battery Backup System (BBS) shall include, but not be limited to the following: Inverter/Charger, Power Transfer Relay, a separate manually operated non-electronic Bypass Switch and all necessary hardware and interconnect wiring.

System Reliability

The BBS shall provide reliable emergency power to a traffic signal system (Vehicle and Pedestrian Traffic) in the event of a power failure or interruption.

The BBS shall be capable of providing power for full run-time operation for an "LED-only" intersection (all colors: red, yellow, green and pedestrian heads) or flashing mode operation for an intersection using Red LED's.

Compatibility

The BBS shall be compatible with NEMA, Caltrans 332L Cabinets, Model 170E Controllers, Model 2070 Controllers and cabinet components for full time operation.

Run-Time

The BBS shall provide a minimum two (2) hours of full run-time operation for an "LED-only" intersection.

Output Capacity

The BBS shall be able to provide a minimum of 1000W @ +25°C, continuous active output capacity, with 80% minimum inverter efficiency while running in Backup Mode (on batteries).

Output Voltage

When operating in Backup mode, the BBS output shall be 120 VAC \pm 5 VAC, pure sine wave output, \leq 3% THD, 60 Hz \pm 0.05 Hz.

DC System Voltage

The BBS DC system voltage shall be either 24 VDC or 48 VDC.

Transfer Time

The maximum transfer time allowed, from disruption of normal utility line voltage to stabilized Backup Mode line voltage, shall be no greater than 40 milliseconds. The same maximum allowable transfer

time shall also apply when switching from Backup Mode line voltage back to utility line voltage.

Operating Temperature

The operating temperature for the inverter/charger, power transfer relay and manual bypass switch shall be -37°C to $+74^{\circ}\text{C}$. Additionally, all components and parts used shall, at the very least, be rated for that temperature range.

AC Feedback

The BBS shall be equipped to prevent a malfunction feedback to the cabinet or from feeding back to the utility service.

Feedback Level

In the event that the AC service feeding the BBS is severed, or there is a utility blackout, the AC voltage measured at the AC inputs to the BBS (Line to Neutral), shall be less than 1 VAC.

Surge Protection

The BBS shall have lightning surge protection compliant with IEEE/ANSI C.62.41 and must be able to withstand 2000 volt surges applied 50 times across line and neutral. These surges shall not cause the BBS to transfer to Backup mode.

Power & Control Connections

The BBS shall be easily installed, replaced, or removed by using easily removable cables for AC input, AC output, DC input, external transfer relay control and battery temperature sense.

AC Connection

The AC input and output shall be panel mounted plug / receptacles that allow no possibility of accidental exposure to dangerous voltages (male receptacle for AC Input and female receptacle for AC Output). The receptacles shall utilize some form of locking mechanism or hold down clamps to prevent any accidental disconnects.

DC Connection

The DC connection shall be a recessed one- or two-piece Anderson style receptacle.

Relay / Temperature Probe Connections

The external power transfer relay control and the battery temperature sense inputs shall be heavy duty panel-mounted style connectors.

General Connections

All connections shall provide mechanically and electrically secure connections without the use of a screwdriver. The only exception will be the 18-position Relay Terminal Block which shall require a small screwdriver for holding down the relay wires.

Relay / Switch Ratings

The Power Transfer Relay and Manual Bypass Switches shall be rated at 240VAC/30 amps, minimum.

Unit Failure

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.

Overload

The BBS must be able to shut down to protect against internal damage in the event of an overload at the output.

Bypass

Placing the Manual Bypass Switch into "Bypass" shall cut AC Utility power to the Inverter/Charger and route it directly to the 332L Cabinet. In this condition, if the inverter is then disabled and the batteries disconnected from the system, the Inverter/Charger unit shall be completely de-energized and shall be safe to remove from the intersection system, while still allowing the intersection to function normally.

1.18 PAYMENT - Full compensation for performing all the work as shown on the plans, as specified in the Standard Specifications and these Technical Specifications, including furnishing all labor, materials, tools, equipment, and incidentals, and performing all alterations necessary to complete the work shall be considered as included in the contract lump sum price paid for Traffic Signal Improvements, and no additional compensation will be allowed therefor.