

CITY OF CONCORD

SPECIAL PROVISIONS

SIGNALS, LIGHTING & ELECTRICAL SYSTEMS

AUGUST, 2017

SPECIAL PROVISIONS

SIGNALS, LIGHTING & ELECTRICAL SYSTEMS

(86-1.01) Description

The work described in this section shall be done in accordance with Section 86 of the 2010 edition of the State Standard Specifications, the 2015 edition of the State Standard Plans, the City Standard Plans and Specifications, Construction Plans, and these Special provisions except unless otherwise specified.

In case of conflict between any of the contract documents, the document, which takes precedence over and shall be used in lieu of such conflicting portions, shall be as specified in Section 5-1.02 of the State of California Standard Specifications.

If a discrepancy exists:

1. The governing ranking of Contract parts in descending is:
 - 1.1 Special provisions
 - 1.2 Project Plans
 - 1.3 Revised standard specifications
 - 1.4 Standard specifications
 - 1.5 Revised standard plans
 - 1.6 Standard plans
 - 1.7 Supplemental project information

(86-1.03) Cost Breakdown

The Contractor shall furnish to the Engineer a cost break-down in accordance with the provision in Section 86-1.03, "Cost Break-Down" of the Standard Specifications and these special provisions.

The cost break-down shall be submitted to the Engineer for approval within 15 days after the contract has been approved. 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. The approved cost break-down may be used to determine partial payments during the progress of the work and as the basis of calculation adjustment in compensation for the term or items of electrical work due to changes ordered by the Project Engineer.

The cost break-down for the contract lump sum items shall, as a minimum, include the following items:

- Foundations – each type
- Standards and poles – list by each type
- Conduit – list by each size and installation method. The agreed upon price shall include trench and pavement restoration, replacement of existing traffic loops and restoration of any curb, gutter and/or sidewalk damaged due to conduit installation.
- Pull boxes – each type
- Conductors and cable – each size and type
- Vehicle signal heads and hardware – each type
- LED signal indications –each type
- Pedestrian signal heads and housings – each type

- Accessible Pedestrian Signal System (APS)
- Luminaires and photoelectric unit
- Emergency Vehicle Preemption equipment – each component
- Cabinet and controller installation (including foundation)
- Service cabinet equipment and enclosures (including foundation)
- Battery Back Up (BBU) system including batteries
- Actelis modem or approved equal
- Loop detectors
- Luminaires and lighting fixtures
- Pan Tilt Zoom (PTZ) camera including cables and all fixtures
- Video Detection Camera including cables and all fixtures

(86-1.04) Equipment List and Drawings

All product submittals shall be provided to the City, 15 calendar days prior to equipment and material orders.

The Contractor shall submit to the City, for approval, all applicable submittals including, but not limited to, name of manufacturer, manufacturer’s catalog cut sheets, schematic wiring diagrams, material descriptions, and any other material relevant to the components included in these Special Provisions. These submittals shall be approved by the Engineer, prior to any equipment deliveries to the City. Any equipment that is delivered to the City and rejected by the City shall be removed and replaced at the Contractor’s expense.

The Project Manager shall supply two (2) sets of laminated 17”*11” copies of the as built signal plans to City staff after completion of the project.

(86-1.06) Maintaining Existing Electrical Systems

Maintaining existing electrical systems shall conform to the provisions of Section 86-1.06, "Maintaining Existing and Temporary Electrical Systems," of the State Specifications. Existing traffic signal systems shall be kept in effective operation for the benefit of the traveling public during the progress of the work, except when shut down is permitted. The traffic signal shutdowns shall be limited to the hours of 9:00 a.m. to 3:30 p.m., and shall be permitted only during the switch over from existing to new controller operation, unless prior approval is obtained from the Engineer.

Temporary standards with signal equipment may be required during modification of existing signal systems. The Contractor shall provide temporary equipment if the Engineer deem necessary. The cost of the temporary system shall be included in the lump sum price paid for signal modifications and no additional compensation shall be allowed.

The Contractor shall notify the Engineer 72 hours prior to any operational shutdown of existing signal system.

Any existing equipment or devices damaged during an ongoing construction projects (examples: installation of a new traffic signal, modification of an existing traffic signal, ADA accessibility projects, street repaving projects, etc.), the contractor shall replace damaged equipment or devices with new ones at no cost to the City. Those equipment shall include but not limited to signal cabinet, controller, PPB’s, Accessible Pedestrian Signal (APS), loops, wiring, SIC, BBS, APS, signs, etc.

If an ongoing project require temporary changes in striping to facilitate the work, the contractor shall be responsible for implementing the temporary striping including restoration to original striping at no cost to the City.

The contractor shall be responsible for cleaning up and restoring the rock sump on any pull boxes (existing or new) that has been adjusted or replaced as part of the project. The contractor shall take extra care to insure that no debris enter any conduit during construction.

Full compensation for performing the work in these specifications shall be included in the prices paid for the various contract items of work and no additional compensation will be allowed therefor.

(86-1.07) Scheduling of Work

The initial installation and turn-on of new equipment shall be made on a Tuesday, Wednesday, or Thursday, if not a holiday. The turn-on shall be the first order of work for that day and all facets of the traffic signal installation shall be functional.

Present at the time of the turn-on shall be a representative from the Electrical Contractor, Controller/cabinet Manufacturer (when applicable), Actelis Manufacturer (when applicable), Video Detection Camera (when applicable), Pan Tilt Zoom Camera (when applicable), Public Works - Maintenance Services Staff, and Community & Economic Development (Engineering and Transportation Division) Staff. The contractor shall assume the responsibility of contacting and coordinating all the stake holders as mentioned above.

In the event that the Contractor is unable to respond to a problem that develops during the functional test, or for any reason is unable to correct the problem in a timely fashion, as determined by City staff, the City staff may have its own maintenance personnel work on the problem. Any such work performed by the City shall not invalidate the guarantee provided for in these Specifications, and shall be at the Contractor's expense.

All vehicular and pedestrian signal indications including APS systems shall remain covered with burlap or approved equal during installation of new traffic signals. Those covers shall only be taken off on the day of turn on. If the turn on is not successful, all indications described above shall be covered again with burlap or approved equal and remain covered till the successful turn on of the new traffic signal.

All existing stop signs on minor and major streets (if applicable) shall be removed only on the day after successful turn on of the new signal.

(86-2.03) Foundations

Schedule 40 PVC or Schedule 80 PVC (as shown on the plans) with bell bushings shall be used in all cabinet and pole foundations (See Detail Cabinet & Foundation). A 5/8 inch, 10-foot ground rod shall be installed in the controller cabinet foundation including service cabinet foundation.

The cabinet foundation shall have a 36"x20"x6" recessed area for all conductors. Edges/corners of the foundation shall use chamfer strip.

Forms exposed portions of the foundation to present a neat appearance and shall be true to line and grade. The top of the foundation posts and standards, shall be finished to curb or sidewalk grade except special foundations or as directed by the Engineer. Forms shall be rigid and securely braced in place. Conduit ends and anchor bolts shall be placed in proper position and to proper height. Anchor bolts shall be installed a maximum of 1:40 from vertical and shall be held in place by rigid top and bottom templates. The bottom template shall be made of steel and shall be at least ½ inch thick. The bottom template shall provide proper spacing and alignment of anchor bolts near the embedded bottom end and shall be installed before placing footing concrete.

The mortar shall be no thicker than thickness of the highest leveling nut/nuts leveling plus or minus ½". The highest leveling nut shall be set to grade.

The controller cabinet pad and service enclosure shall have a concrete walk access to it from the existing sidewalk.

(86-2.04) Standards, Steel Pedestals and Posts

The identification number shall be stamped on the top of the base plate with minimum ½ inch characters in lieu of the riveted stamped identification number on the shaft above the handhole as described on the State Standard Plan ES-7M.

Traffic signal poles shall be set back from face of curb no less than 30 inches to face of standard or pole, and the base plate installed parallel to the flow (direction) of traffic unless otherwise specified by the Engineer. All poles shall be leveled using a level. All signal poles and signal standards shall be galvanized except downtown area.

Within the downtown periphery, all signal poles and signal standards shall be powder coated (minimum two coats) "TIGER Drylac Powder Coatings" Super durable 038/80020, Jet Black, SAT/SM, 35min338F/170C-15min392F/200C, B.:773276598 (www.tiger-coatings.com, www.tiger-coatings.us, 1-800-243-8148) or Valmont, Color: Jet Black RAL 9005, Valmont Specification: F540DO (1-800-825-6668).

Outside of downtown area, all signal poles and signal standards shall be galvanized.

All holes drilled for wire entry (i.e. pedestrian and vehicle terminal compartments, and APS/pedestrian push button) shall be filed to remove all sharp edges.

Any incorrectly drilled or otherwise damaged poles must be repaired by a certified welder to the manufacturer's specifications at the expense of the contractor.

Signal mast arms shall not have a negative angle. If so, the contractor shall contact the manufacturer and correct the negative angle issue.

Signal standard shall be Type 1-A or as shown on the project plans.

(86-2.05) Conduit

Conduit shall be per section 86.2.05 Conduit of the State Specifications except as modified herein. Conduit shall be installed by directional drilling or jacking and boring methods unless otherwise noted. The work shall include trench backfill and restoration per details on the plans. Furthermore, regardless of which method is chosen, the Contractor shall pothole as needed to locate existing utilities. The Contractor shall assume all risk associated with chosen method of installation, and shall fully locate and verify utilities prior to conduit installation. No additional compensation shall be allowed due to delays or changes in installation method.

Conduit runs shall have no more than 180° of bends, unless authorized by the Engineer, and shall enter the pull box vertically at 90°. When trenching is allowed for conduit installation, the top of the installed conduit shall be a minimum of 24 inches below finished grade in the street section. Where the asphalt concrete (AC) portion of the roadway cross section is greater than 24 inches in depth, the finished height of the conduit shall be two (2) inches below the AC section. The trench shall be back filled with two inches of commercial grade sand with the remainder being 2% red oxide concrete, 5 sack concrete.

Conduit installed in non-paved areas shall be covered with conductive plastic underground warning tape six inches above the conduit.

Schedule 40 Polyvinyl Chloride (PVC) and Schedule 80 High Density Polyethylene (HDPE) shall be used throughout the project as shown on the plans.

All conduits shall be three inches (3") minimum or otherwise as shown on the plans or specified in these standard specifications. The contractor at his sole expense may use larger conduit subject to approval by the Engineer. Where larger conduit is used, it shall be for the entire length of the run. No reducing couplings shall be permitted underground.

The ends of conduits in pull boxes shall have Bell Bushings and be a minimum of two inches above the surface of the rock, and between eight and ten inches below the top of the pull box.

Loop stub outs shall be two-inch PVC with bell bushings on each end

For all new signal and modified traffic signal (where new cabinet and controller will be installed) project, three (3) – 4 inches conduit shall be installed between the controller cabinet base to the adjacent home run pull boxes. Out of three conduits, one conduit shall be exclusively dedicated to run signal interconnect cable only through a separate interconnect pull box. Splicing shall not be allowed in any of the home run pull boxes. The contractor shall install additional 2” conduits to run service conductors from controller cabinet to the service cabinet; and from home run pull box to the service cabinet.

(86-2.06) Pull Boxes

(86-2.06A) Materials

All pull boxes shall be of the Quazite "PG" style construction, or approved equal, and shall be gray in color except otherwise specified. Pull box lids shall have a non-skid surface. At locations other than adjacent to the controller cabinet, and at advance loop locations, number 6 (17" x 30") pull boxes shall be used throughout the project unless otherwise specified on the plans. All home run pull boxes adjacent to the cabinet shall be quazite flared wall style (17"*30") or approved equal with no hold down bolts. No splicing shall be allowed in these pull boxes. Pull boxes near advance loops shall be number 5 (13"X24") Quazite "PG" style or approved equal. No bolt down lids shall be used.

Pull boxes shall be set square to face of the curb and shall be leveled with the existing grade.

(86-2.06B) Cover Marking

Marking shall be clearly defined, uniform in depth, and parallel to either the long or short sides of the cover. All pull boxes containing street lighting, interconnect, or service exclusively, shall be supplied with pull box lids that accurately reflect their contents. All pull box lids shall be tier 8 and shall have the words "Traffic Signal," "Street Lighting," "Interconnect," or "Service" on the lid, and shall not be of the bolt-down type. Lids shall be protected or reversed during the course of construction. All lids damaged or scuffed from construction shall be immediately rejected and shall be replaced by the Contractor at no expense cost to the City.

(86-2.06C) Installation and Use

Pull boxes in non-paved or asphalt areas shall be constructed with a minimum 4 inch deep x12 inch wide concrete apron. The concrete apron shall be wrapped around with a one (1) #4 rebar.

On all runs, the spacing of pull boxes shall not exceed 200 feet measured along the conduit or as shown on the plans. If required, the contractor shall install additional pull boxes to facilitate the work. On those runs exclusively for "interconnect," the spacing of pulling points or pull boxes shall not exceed 300 feet, unless otherwise directed by the Engineer. No drain hole or grout shall be placed in the sump area.

A minimum of six inches of ¾ inch drain rock shall be placed under each pull box. All pull boxes shall be inspected and approved prior to pulling any conductors.

All pull boxes shall have a rodent prevention screen made up of ¼" galvanized wire mesh to be installed over the leveling drain rock sump. The wire mesh shall extend minimum 6" on all sides around the pull box (see attached "WIRE MESH FOR PULL BOXES" drawing in Appendix "A").

(86-2.08) Conductors and Cables

(86-2.08E) Signal Interconnect Cable

Signal Interconnect Cable (SIC) shall consist of 25 pair AWG #22 air pack AWG solid twisted pairs and comply with Rural Electrification Administration (REA) Specification PE-22 at 5 twists per foot, or as determined by the Engineer. A quality assurance certification shall be provided.

There shall be a minimum of 6 feet of slack at each cabinet controller and at each pull box marked SIC to allow for servicing.

The Contractor shall notify the Engineer 48 hours in advance prior to cutting the existing SIC. The Contractor shall not cut the existing SIC until the controller cabinet has been installed. New and existing SIC shall be connected to the new or existing controller cabinet as soon as possible. No more than 48 hours shall pass with the SIC being severed.

Air compressor shall be used to clean existing SIC conduit by blowing air through the conduit before pulling new SIC.

(86-2.09) Wiring

(86-2.09B) Installation

Conductors shall be permanently identified as to function. Identification shall be placed on each conductor, or each group of conductors comprising a signal phase in each pull box and near the end of terminated conductors,

Identification labels shall be embossed and shall be direct labeling method. Labels shall be fastened to the conductors in such manner that they will not move along the conductors. Labeling shall be performed by mechanical methods. Labeling are required for loops, signal conductors, SIC and any other conductors within cabinet and pull box

Only poly-based lubricants shall be used. Conductors shall not be pulled into conduits until the pull boxes have been set to grade and ¾ inch aggregate installed.

Conductors shall not be pulled into conduits unless a representative from City's Traffic Signal Section is present to observe the operation. The end of all unused conductors and cables shall be sealed.

All conductors and cables shall be pulled through the conduits with the same wire pull. Slipping of conductors shall not be allowed. Only mule tape shall be used to pull conductors. Each conduit shall be left with a mule tape.

Separate pull boxes shall be installed to accommodate splicing of loop wires including termination or as shown on the plans.

AWG #10, AWG #12 and AWG #14 conductors shall be solid with 45 mils thickness. AWG #8 conductor shall have seven (7) strand with 45 mils thickness and AWG #2 conductor shall be stranded with 60 mils thickness.

The signal conductors shall be organized in a bundle to allow for easy identification for wires and cables.

All conductors require bundling inside the cabinet shall be bundled and terminated neatly. Nylon wire tie wraps spacing shall be at 18" O/C.

Slack for each conductor shall be as shown in the following table:

CONDUCTOR SLACK REQUIREMENTS

Location	Slack (feet)
Signal Standard	1
Lighting Standard	1
Signal and lighting Standard	1
Pull Box	6
Splice	3

(86-2.09D) Splicing

Conductors shall not be spliced in the home run pull box/boxes adjacent to the controller, but shall be continued to terminals in the cabinet.

All conductors, including neutrals, shall be spliced by methods shown on State Standard Plan ES-13A. Splices shall be soldered using 60-40 rosin core solder only. Splices shall be insulated by Method "B" as described on State Standard Plan ES-13A.

Separate neutrals shall be used from terminal block to pull boxes for all vehicle, pedestrian and push button assemblies. Separate neutrals shall be used for all mast arm signal heads. No jumpers shall be allowed. All splices and terminals shall be soldered.

(86-2.10) Bonding or Grounding

The grounding jumper at each pole shall run continuous to the adjacent pull box attached to the bond wire using Copper C-Tap, or equivalent, compression connector and shall be soldered with 60-40 rosin core solder. All grounding wire shall be No. 8 bare stranded copper wire.

(86-2.11) Combined Service & Battery Back Up System

The Service cabinet and Battery Back Up System (BBS) cabinet shall be a combined unit and shall be TESCO MODEL 27-22 BBS METERING or City approved equal (see attached TESCO MODEL 27-22 BBS METERING drawing in Appendix "A"). The combined unit shall be furnished and installed by the contractor.

The exterior the combined cabinet shall be powder coated (minimum two coats) Bel Tel Green for project locations outside of downtown area.

The exterior of the combined cabinet shall be powder coated (minimum two coats) "TIGER Drylac Powder Coatings" Super durable 038/80020, Jet Black, SAT/SM, 35min338F/170C-15min392F/200C, B.:773276598 (www.tiger-coatings.com, www.tiger-coatings.us, 1-800-243-8148) or Valmont Color: Jet Black RAL 9005, Valmont Specification: F540DO (1-800-825-6668) for project locations within downtown area.

The interior of the combined cabinet shall be powder coated gloss appliance white.

The Contractor shall coordinate with Pacific Gas and Electric Company for any necessary service Installation. Any fees and costs required by the utility company shall be borne by the Contractor.

Contact Customer Service:

Pacific Gas and Electric
1030 Detroit Avenue
Concord, CA 94519
(925) 674-6457

The service enclosure shall comply with the following specifications:

- Service enclosure shall be 20" Wide X 50" High X 10 ¼" Deep.
- Service enclosure shall meet EUSERC requirements.
- Service enclosure shall be fabricated from ⅛" aluminum.
- Interior of service enclosure shall be fabricated from 14 gauge cold rolled steel.
- Service enclosure shall have continuous welded seams.
- Service enclosure shall have full length deadfront with stainless steel hinge.
- Service enclosure shall be in accordance with UL 508A standards for industrial control panels and labeled for service entrance equipment.
- Service enclosure shall have pull section with removable step.
- Service enclosure shall have fully framed side hinged outer door with swaged close tolerance sides for flush fit with top drip lip & closed cell neoprene flange compressed gaskets.
- Service enclosure shall have hinged deadfront with ¼ turn latch & knurled knobs.
- Deadfront door shall be hinged on the same side as exterior door & open a minimum of 100°.
- Removable back pan shall be mounted on 4 welded ¼" studs.
- All circuit breakers shall be mounted in a vertical position, handle up for "On" handle down for "Off".
- Circuit breakers shall be of cable-in cable-out type.
- Service enclosure shall consist of absolutely no "Bolt-On" or "Plug-In" circuit breakers.
- Service enclosure shall be completely prewired in the factory.
- Wiring will be to NEMA IIB standards showing external connections & external equipment.
- All bussing shall be UL approved copper THHN cable bussing, fully rated.
- The function of all circuit breakers, switches & other components as required shall be identified by laminated engraved plastic nameplates with minimum ¼" letters fastened with minimum of two #4-40 stainless steel machine screws.
- Wiring schematics will be Computer Aided Drafting & include all external equipment & connections per NEMA IIB.
- As Built factory drawings shall be laminated and affixed to the inside of the outer door.
- Manufacturers will be required to furnish independent laboratory certification of metal preparation & finish & to confirm that the overall product meets these specifications. If this agency wishes to witness this testing, all costs to be paid by contractor.
- Traffic signals shall be metered. Safety lighting shall be unmetered.
- Intersection safety lighting conductors shall be in a separate conduit from the home run pull box to the service cabinet.

- The foundation of the service cabinet shall comply with the requirements of Standard Plan ES-2D.
- The entire service cabinet assembly shall be warranted to be free from defects from workmanship and material for two (2) years from the date of shipment by the manufacturer. Any parts found to be defective within the warranty period shall be replaced free of charge by the contractor.
- Service enclosure shall be Tesco Class EN-27-000LB-AP/EN-090-AP or City approved equal.

The BBS shall comply with the following specifications:

ENCLOSURE SPECIFICATIONS

The enclosure shall be of aluminum construction weatherproof and shall house BBS and batteries. Enclosure shall be TIG welded construction with welding materials specifically designed for the material to be welded. Enclosure shall have fully framed side hinged outer doors with swaged close tolerance sides for flush fit with drip lip and closed cell neoprene flange compressed gaskets. Front door shall incorporate a full-length piano hinge, Type II keyed lock, pad-lockable draw latch (center area on door-latch side), and a pad lockable welded-in place vandal-proof tab, rated at 2000 lbs. There shall be no exposed nut, bolts, screws, rivets or other fasteners on the exterior of the enclosure. Maximum cabinet dimensions 46" H x 20" W x 10.25" D. Weight 300 lbs with batteries. BBS shall be mounted in an interior tilt out housing with 800 lb rated stops. Battery connectors shall be Anderson Connectors with silver plated contacts. Batteries shall be installed in fixed position framed shelves for seismic safety and be readily accessible for maintenance. Batteries shall be mounted allowing airflow front and back. Enclosure can include two transfer bypass switches, one for BBS bypass the second for auxiliary generator (optional). All switches must be panel mounted on interior dead front panel board. UV resistant plastic laminated nameplates shall identify all controls and major components. A plastic covered wiring diagram will be attached to the inside of the front door. All components shall be factory wired and conform to required NEMA, NEC, and UL standards. A chassis ground point shall be provided. Panel shall be UL 508 Industrial Control Panel rated. Shall be a city approved model prior to bid. Must meet the following specifications.

BBS PANEL MINIMUM FEATURES:

- Typical run time is (6) six to (12) twelve hours full operation, based on the actual load.
- BBS bypass and BBS isolation switch.
- Deadfront safety panel board with all switches and plugs pre-wired with phenolic nameplates.
- All nameplates shall be phenolic engraved type.
- All wire terminating lugs shall be full wrap around type.
- All batteries shall be captive spaced from external captive sides in earthquake proof shelving.
- Cabinet ventilation shall be by (qty. 2) 4" x 1/4" louvers top and bottom with encapsulated bug screens, cleanable filters and a 100cfm fan to completely exchange air 25 time minimum per minute.
- All DC terminals and connections shall incorporate safety covers such that the safety covers are in place for every normal maintenance mode.
- Event Counters & Total Run Time Counter.

BBS UNIT MINIMUM SPECIFICATIONS:

BBS unit shall provide a true sine-wave output with minimum 2000 Volt-Amp continuous capacity. BBS must provide for utility service isolation when in operation. The minimum rating for wattage output will be 1200 watts. The BBS shall be capable of running an intersection with LED lights (for Run Time consult manufacturer). The unit shall operate off-line, with transfer time of 2-4 ms or less, with battery condition indicator, with automatic test provisions, and with hot-swappable batteries (all batteries in system). BBS will automatically recharge batteries from full discharge to 90% capacity within 8 hours. BBS will provide on-line operation for a minimum input of 90 to 150 VAC, provide full load output of 120VAC – 10% / +4% at 60 Hz +/- 0.05% over a temperature range of -37° C (-34.6° F) (optional adder) to +74° C (165.2° F) and conform to and be based on a UL Approved Design.

For safety and maintenance the inverter shall not exceed 40 pounds. The BBS unit will be delivered with maintenance manuals.

BBS UNIT MINIMUM FEATURES:

- 2KVA 1200 Watts, with quick make/break connectors and plugs. (Systems requiring hard wiring termination to/from the inverter are unacceptable).
- Surge energy - Per IEEE 62.41 (formerly IEEE 587)
- Common mode clamping 0 ns < 5ns typical UL 1449
- Conditioned power – Computer quality
- Transient lighting protection – Per IEEE 62.41 (formerly IEEE 587)
- Transfer to battery time – 2-4 ms
- Retransfer to utility – 2-4 ms
- Each battery shall be 24 volts @ 18 AH with heavy duty Anderson plugs connections to the BBS for greater system reliability and ease of maintenance. Series wiring is unacceptable.
- Fan cooling shall be fused for locked rotor current.
- Cooling air shall be ducted to cool the front and back of each battery with air space on all four sides and top of battery.
- Inverter covers shall be 60% open on both sides to diminish the environmental effects of extreme temperatures.
- Includes USB & RS232, DB9 Computer Interface Ports.
- Low voltage safety design at 24V DC. (Higher voltage DC systems are unacceptable).

BBS COMMUNICATIONS MODULE:

All inverter connections shall be made without the use of tools. This includes: A/C-Input, A/C-Output, Normally-Open, and Normally-Closed programmable contacts.

Smart Slot Relay I/O Module;

Input #1	Turn the BBS on.
Input #2	Turn the BBS off.
Input #3	Start the BBS self-test.
Input #4	Shut down the BBS (when on battery).
Output #1	The BBS is on-battery (during a power failure, self-test or run time calibration).
Output #2	BBS has a low battery – Programmable.
Output #3	The protected load is not receiving power from the BBS.
Output #4	Replace the BBS batteries.
Output #5	The BBS is overloaded.
Output #6	Any BBS fault or self-test failure.

BATTERIES:

Batteries shall be maintenance-free, type AGM/VRLA (Absorbed Glass Mat / Valve Regulated Lead Acid). Batteries shall be independently pre-wired and individually fused. Batteries shall be furnished with heavy-duty 50 amp rated silver-plated Anderson Connectors. 100 Amp internal fuse by Battery supplier. Batteries shall be lightweight for personnel safety and protection plus ease of installation and maintenance. Batteries with a weight of over 26 lbs are not acceptable. A minimum of six (6) batteries shall be furnished by the contractor.

ENCLOSURE TEMPERATURE COMPENSATION:

Operating temperature shall be a minimum -37° C (-34.6° F) to +74° C (165.2° F).

POWER SYSTEM ANALYZER AND CONFLICT RESOLUTION MODULE:

The inverter incorporates an integrated power system analyzer and conflict resolution system. The analyzer will evaluate and make limited adjustments to the incoming utility power and will automatically transfer load to the battery back-up power if utility power is lost. When utility power becomes available, the BBS will analyze the power to verify stability and return to normal operation. The system provides automatic BBS failure detection and automatically isolates the failed BBS and locks the unit on to utility power. Once the failure has been corrected, the system will return to normal operation.

TRIPLE BYPASS SYSTEM FOR OFFLINE BBS:

1. Power Analyzer with Conflict Monitor Isolation and Transfer Module.
2. PCM – Power Conflict Monitor. The PCM is a totally redundant failsafe system. It monitors load bus power available continuously. If load bus power fails for 5ms the PCM will transfer and isolate the BBS and guarantee that commercial power will be locked on.
3. Timer – Redundant 5 ms delay and hard transfer to utility power.
4. The outboard Transfer Switch shall not interrupt the normal controller function. Transfer time shall be 2ms.
5. Onboard I/O module will execute lockout of battery backup system upon detection of any inverter BBS fault. If BBS resets itself, it will automatically be available for backup.
6. ON Inverter to timed relay for Full Time control of Output, 0 to 10 hours.

BATTERY CHARGER:

Shall charge from shut off discharge to 90% fully charged in less than 8 hours. The battery charger shall utilize Advanced Battery Management to extend battery life.

ADVANCED BATTERY MANAGEMENT:

Protection at the cellular level means longer battery life – Improved reliability results from a precision battery charging system, and automatic true-load battery tests. Redundant overcharge protection contributes to longer battery life. Undervoltage Boost and Overvoltage Buck regulates under and over voltages without switching to battery.

Battery Replacement Warning prevents downtime – The Inverter is capable of performing a self-test every two weeks. This ensures that you will be alerted to degrading batteries before they wear out. Through software, or the push of a button, self-tests may be performed at any time. Faster Recharge Time – The inverter battery charging systems are microprocessor controlled to

precisely charge batteries in less time than legacy BBS systems. This makes the system available more quickly for subsequent power disturbance.

HOT-SWAPPABLE BATTERY REPLACEMENT:

The 60 second, user friendly, hot-swappable battery replacement system – Saves the time and expense of returning the BBS to the factory for battery service, and allows safe and easy replacement of batteries while your system is up and running. Replacement battery packs ship in a reusable box for convenient return of exhausted batteries to a recycling center.

ADDITIONAL REQUIREMENTS:

- Manual transfer switch with BBS bypass and generator plug
- Automatic transfer switch (ATS) and generator plug
- 30 amp or 50 amp external reverse service generator plug
- Keyed lock (Core or #2 Corbin)
- 3-pt latch
- Web SMNP/Ethernet (IP addressable communication)
- On Battery external indicating light
- Combination metering, distribution, BBS combination cabinets available

WARRANTY:

Manufacturers shall provide a two (2) year factory-replacement parts warranty on the BBS. Batteries shall be warranted for full replacement for two (2) years. The warranty shall be included in the total bid price of the BBS.

(86-2.14) Testing

Prior to field installation of the traffic signal cabinet and controller, the Contractor shall deliver (F.O.B.) the Model 2070L controller, fully wired Type "P" TS2-Type 1 cabinet including all auxiliary control equipment required for the controller and cabinet assembly to be operational as specified in these Special Provisions) to the City of Concord Corporation Yard Traffic Operations, 1455 Gasoline Alley, Concord, California for the designated 21-day operational testing period.

The Contractor shall be responsible for transport of the equipment to City's Corporation Yard and from Corporation Yard to the project site. Deliveries shall be made on Monday through Thursday between 8:00 a.m. and 3:00 p.m. and staff can be reached at (925) 671-3104 to arrange delivery of controller and cabinet

All shipping cartons and cabinets shall be externally labeled with the name of the final installation location.

The manufacturer of the controller and cabinet system shall certify to the Engineer that the controller hardware and software has been thoroughly bench and operationally tested and that as a controller system, all components are operating in conformance with these Special Provisions.

City staff will test the controller and cabinet equipment for continuous satisfactory operation (without failure) for 21 consecutive calendar days. Delivery of controller equipment for testing shall occur a minimum of 30 calendar days prior to being picked up by the contractor for installation. If equipment is rejected, the contractor shall allow additional 30 days for retesting.

When the controller cabinet has been satisfactorily shop tested, a representative from Public Works (PW) Maintenance Department will notify the Contractor that the cabinet is available for pick up. The Contractor shall provide equipment and personnel, as necessary, to safely load the controller cabinet.

City staff will develop signal timing data sheet and will program the controller including installation of controller at project location.

The contractor shall bear the full cost all shipping, handling, and related transportation costs associated with testing and retesting (if applicable).

Documentation

Two manuals shall be supplied for all equipment and components of the system. Documentation shall be supplied explaining the operation of all system features. Additionally, the contractor shall provide one (1) laminated copy (17"*11") of signal plan to City staff.

(86-2.16)Painting

The exterior of the controller cabinet, combined service and battery backup system (BBS) cabinet shall be powder coated (minimum two coats) "TIGER Drylac Powder Coatings" Super durable 038/80020, Jet Black, SAT/SM, 35min338F/170C-15min392F/200C, B.:773276598 (www.tiger-coatings.com, www.tiger-coatings.us, 1-800-243-8148) or Valmont Color: Jet Black RAL 9005, Valmont Specification: F540DO (1-800-825-6668) for project locations within downtown area.

The exterior of the controller cabinet, combined service and BBS cabinet shall be powder coated (minimum two coats) Bel Tel Green for project locations outside of downtown area.

The interior of the controller Cabinet, combined service and BBS cabinet shall be powder coated gloss appliance white.

The factory powder coat finish for the controller cabinet, combined service and BBS cabinet shall be applied as described below:

- a) Acid etch degreasing bath
- b) Clean water rinse
- c) Iron Phosphate adhesion bath
- d) Clean water rinse
- e) Non-chromate acidulated seal batch
- f) Thermal Set Process
- g) Convey parts through drying oven for then minutes at 300 to 400 degrees Fahrenheit
- h) Apply polyester or epoxy based dry powder coating at 75-90KV
- i) Convey parts through drying oven for thermal setting for 20 minutes at 400 degrees Fahrenheit

All existing cabinets require repainting shall first be sanded and then primed. Any corroded spots shall be neutralized with a corrosion inhibitor prior to priming. The cabinet then shall be painted with two coats of paint as specified by the City staff.

(86-3) CONTROLLER ASSEMBLIES

General

Work under this section shall include the installation of 2070L traffic signal controllers as indicated on the project plans.

Technical and Functional Requirements

Model 2070L Controller shall be used for this project.

The Contractor shall supply the Naztec Model 2070L Controller with the following modules from the City's existing purchase contract #1793.

- 2070-1B CPU with 10 Mb Ethernet
- 2070-2B Field I/O Card
- 2070-2NZ Side Mount Adaptor
- 2070-3B High Resolution Display Panel Assembly (8 Line x 40 Char) backlit panel with dual keypad.
- 2070-4B Power Supply, 3 Ampere Output
- 2070-6B Modem Card
- 2070-2A Card
- Naztec's Latest Apogee Local Intersection Software
- Microware OS/9 Real-Time Operating System
- Naztec Hardware Validation Suite (ValSuite) Test Software
- C2P Modem Harness
- The entire controller assembly shall be warranted to be free from defects from workmanship and material for one (1) from the date of shipment by the manufacturer. Any parts found to be defective within the warranty period shall be replaced free of charge by the contractor.

Traffic Signal Controller Software

The Contractor shall install the latest version of NAZTEC APOGEE local intersection software in Naztec Model 2070 L controllers to be compatible and completely functional with City's ATMS.NOW central traffic signal controller communication software prior to delivering controller to the City for testing. The most current version of NAZTEC APOGEE, at the time of project advertising, shall be fully configured in the Model 2070L controller.

The Contractor shall provide licenses, which include the basic support and integration for use of this software, if necessary.

Telemetry

The external telemetry to and from the controller shall be via the communications module on the controller. An adapter cable shall be constructed and provided as necessary to interface the controller's communications module to the cabinet's telemetry interface.

(86-3.04) Controller Cabinet

General

Work under this section shall include the installation of Type "P" TS-2 Type 1 traffic signal cabinets as shown on the plans.

Technical and Functional Requirements

Cabinet Assembly

The contractor shall furnish Cabinet assembly NEMA "P", TS – 2 Type 1 cabinet delivered with all required peripherals capable of operating an eight (8) - vehicle phase, four (4) - pedestrian phase and 4 overlap phase intersection, and shall include the following:

- The cabinet shall be capable to house a Naztec 2070L traffic controller unit (CU), operating latest Apogee local intersection software.
- Detailed shop drawings of the cabinets showing dimensions, equipment placement layout, auxiliary panel placement and dimensions, and labeling shall be submitted upon request for review and approval prior to manufacture.
- The cabinet shall be designed for 16 channel operation.
- Load switches 1-8 shall be for vehicle phases 1-8.
- Load switches 9-12 shall be for overlap phases A, B, C & D.
- Load switches 13-16 shall be for pedestrian phases 2, 4, 6 & 8.
- All load switch sockets shall be configured in a manner as described above without rewiring the back side of the load-bay.
- BIU load switch drivers 1-16 shall be wired to appropriate load switch sockets via a terminal block located on the front side of the load-bay as to allow checking voltage inputs to the load switch sockets without dropping the load- bay
- The cabinet shall have .125" thick (minimum) Aluminum enclosure with minimum exterior dimensions: 55 inches H x 44.5 inches W X 26 inches D.
- The cabinet shall have powder coating finish free from scratches and weld flash. The welds shall be neatly formed, smooth and continuous.
- The top of the cabinet shall incorporate a 5° – 10° crown or slope from front to rear to prevent rain from accumulation.
- A rain resistant air flow exhaust channel shall be present along the entire width of the cabinet body, located above the door. The cabinet exhaust channel shall include a screen, and lack any slots or cavities, which would allow flying insects to build nests.
- Prior to delivery, the surface of the cabinet shall be cleaned to remove oil film, weld black, mill ink marks and leave the surface clean, bright, smooth, and non-sticky to the touch.
- The cabinet shall be designed for mounting on a concrete foundation using contractor furnished anchor bolts. The height of the foundation shall be 18" from

finished grade for a standard “P” cabinet and 12” for a stretch “P” cabinet and or as shown on the plans.

- The cabinet foundation shall have a 36”x20”x6” recessed area for conductors. All edges/corners of the foundation shall use ¾” chamfer strip.
- The cabinet door shall be equipped with a three (3) - point latching mechanism to firmly secure the door at the top, bottom and center of the cabinet with stainless steel handle, and Corbin #2 lock or approved equivalent. Two keys shall be supplied.
- The cabinet door shall be hinged on the right side of the cabinet as viewed facing the cabinet door opening. The door hinge shall be a one-piece continuous stainless piano hinge, with a stainless steel pin, running the entire length of the door.
- The cabinet shall include an auxiliary switch panel mounted to the interior side of the police compartment on the cabinet door. The panel shall be secured to the police compartment by two (2) screws and shall be hinged at the bottom to allow access to the soldered side of the switches with the use of only a Philips screw driver. Both sides of the panel shall be silk-screened. Silk-screening on the back side of the switch panel shall be upside down so that when the panel is opened for maintenance, the silk-screening will be right side up. All of the switches shall be protected by a hinged see-through Plexiglas cover. At a minimum, the following switches shall be included: Controller ON/OFF Switch, Signals ON/OFF Switch, Stop Time Switch, Manual Advance Switch, 8 -Vehicular Phases Test Switches, 4 - Pedestrian Phases Test Switches, 4 - Preemption Test Switches and Auto/Off/Flash Switch with protective covers or shields.
- A hinge police compartment door shall be provided on the outside face of the cabinet door to permit access to a switch panel. There shall be no exposed electrical terminals accessible from the police compartment. The size of the police compartment and door shall be as needed to accommodate the required switches, plugs, and/or jacks and to provide storage of the coiled, hand held manual push button switch cable.
- The police compartment door shall be provided with a treasury type police lock or exact equivalent. Two keys shall be supplied.
- The police compartment door shall close against a weatherproof and dust-tight, closed-cell neoprene gasket seal. The gaskets shall be attached to the cabinet door with a permanent adhesive bond.
- The police door must contain a metal rear cover on the inside of the cabinet to protect the switches and connections.
- The police panel shall include two (2) ¼ inch RCA phone plug clearly labeled as #1 and #2. #1 shall be “Stop Time” and wired to the stop timer for all pre-programmed standard ring structures #2 shall be a manual advance. The cabinet shall also include a stop timer switch fully insulated ergonomic push button with six (6) – foot coil extension.
- The cabinet shall be equipped with two individually temperature-controlled fans. The lighting fixture installed in cabinet shall use the Type B door actuated “On-Off” switch and shall use two (2) LED lights bars: one shall be installed between the two fans and the other shall be installed underneath the document drawer; and shall not hinder the operation of the drawer.

- The cabinet shall contain a pleated paper filter, to filter the incoming air. The filter shall be non-corrosive, vermin and insect proof, removable, and replaceable shall be secured to the louvered air entrance on the cabinet assembly door.
- The cabinet shall be provided with a thermostat to control the operation of the ventilation fan. The removable cabinet light, thermostat and fan panel is to be located on the top of the cabinet plenum. The thermostat shall be adjustable between 27° C (80.6° F) to 66° C (150.8° F).
- The cabinet shall be equipped with two (2) adjustable equipment shelves
- The top shelf shall be dedicated for detector racks.
- The bottom shelf shall be dedicated for the controller assembly, power supply unit and Malfunction Management Unit (MMU).
- The cabinet shall be equipped with one (1) power panel, with 50A line filter, 20A equipment circuit breaker, and 50A signal circuit breaker.
- The cabinet shall be equipped with one (1) duplex non-GFI power receptacle mounted on top left inside corner of the cabinet, and one (1) duplex GFI power receptacle mounted on lower right side of the power supply panel immediately below the circuit breakers.
- The cabinet shall be equipped with pull-out document drawer.
- The cabinet shall be equipped with one (1) 16 – Position load bay, with terminal block silkscreen on both sides of all panels.
- The cabinet shall be equipped with two (2) racks. Each rack with eight (8) slots – two (2) channel detectors (for a total of 32 channel detectors), one-inch single slot detector card, and two (2) optical detector units. Each detector channel shall include an associated 3-position toggle switch for "Normal/Momentary/ON" operation installed on the detector lead-in cable (DLC) input panel.
- The cabinet shall be equipped with a single 32 channel detector panel with integrated test switches for each channel.
- The cabinet shall be equipped with two (2) NEMA TS2 power supply, rated a 5A output.
- The cabinet shall be equipped with one (1) EDI 16 channel Malfunction Management Unit (MMU). The MMU shall be an Eberle Design, Inc., Model MMU2-16LE (ip) with Ethernet and RS 232 or approved equal. . The MMU shall be capable for monitoring up to 16 traffic signal indications (channels) for conflict, improper sequencing, incorrect timing, and improper voltage levels. The MMU shall be fully compliant with NEMA Standard TS2-2003. The MMU shall also be capable of operating in older TS1 type cabinets and be compatible with 12-channel Conflict Monitor Units conforming to NEMA Standard TS1-1989.
- The cabinet shall be equipped with six (6) TS2 Bus Interface units (BIU), with RS-232 diagnostic ports and socket mounted IC's for ease of repair.
- The cabinet shall be equipped with twelve (12) Model 200 load switches, dual indicating (I/O).
- The cabinet shall be equipped with one (1) Model 204 flasher, dual circuit.
- The cabinet shall be equipped with six (6) Model 430 flash transfer relays.
- The cabinet shall be equipped with sixteen (16) EDI Oracle 2E (dual channel) loop detector amplifiers or approved equal, one inch single slot per detector.

- The cabinet shall be equipped with eight (8) Load bay jumpers.
- The cabinet shall be equipped with one (1) Naztec Model 2070-2NZ TS2 interface adaptor, with front-mounted RS-232 data ports, SDLC interface to the Model 2070L CU and TS2 power supply connection to the CU.
- The cabinet shall be equipped with a single RS-232 data communications serial cable from Controller Unit (CU) 2070-7A, two (2) Opticom phase discriminator cards and the Naztec MMU event log data devices to allow data transfer in to the Model 2070L CU.
- The cabinet shall be equipped with Type full size 66B4-25 telephone termination block (25 pair).
- All CU, BIUs and MMU cables shall be sufficient length to allow the movement of the CU and the MMU.
- All wiring shall be neat in appearance. All cabinet wiring shall be continuous from its point of origin to its termination point. Butt type connections/splices shall not be accepted.
- All connecting cables and wire runs shall be secured by mechanical clamps or nylon wire tie wraps. Stick on type clamps shall not be accepted.
- The Cabinet/Controller Unit (CU) and Opticom phase discriminator cards (minimum 2) shall be Contractor furnished.
- The cabinet shall have a test panel mounted on inside of the door with momentary buttons.
- The test panel shall be equipped with LED lighting bars.
- The stop time toggle switch shall have three way positions, auto, off and on. On shall be the momentary position.
- The cabinet shall have a feature so that MMU or CU can be replaced without the signal reverting to flash operation only when the door is open.
- The Cabinet foundation shall include all required anchor bolts and PVC conduit(s), as shown on plans, from cabinet to home run pull boxes.
- The cabinet shall be assembled and tested by the manufacturer or by the authorized representative to ensure proper component integration and operation.
- The exterior of the cabinet shall be powder coated (minimum two coats) Bel Tel Green for project locations outside of downtown area.
- The exterior of the cabinet shall be powder coated (minimum two coats) "TIGER Drylac Powder Coatings" Super durable 038/80020, Jet Black, SAT/SM, 35min338F/170C-15min392F/200C, B.:773276598 (www.tiger-coatings.com, www.tiger-coatings.us, 1-800-243-8148) or Valmont Color: Jet Black RAL 9005, Valmont Specification: F540DO (1-800-825-6668) for project locations within downtown area.
- The interior of the cabinet shall be powder coated gloss appliance white.
- The cabinet supplier or their authorized representative shall be available within 48 hours' notice to assist in locating and correcting any operational problems with the cabinets during City's test operation and providing turn-on technical support assistance.
- The entire cabinet assembly shall be warranted to be free from defects from workmanship and material for one (1) from the date of shipment by the manufacturer.

Any parts found to be defective within the warranty period shall be replaced free of charge by the contractor.

(86-4) Vehicle Signal Faces/Heads & Fittings

Until ready for use, signal faces shall be securely covered so that no signal indications are visible. A flash hole no larger than one inch in diameter may be placed in front of each lens. Traffic signal heads shall be of polycarbonate construction with matte black. Pedestrian signal housing shall be of aluminum construction with matte black. Mounting hardware shall be as per State Standard Plan (ES-4A), unless otherwise indicated on the Project Plans.

Terminal compartments, Mast Arm Side (MAS) mount, curved washers, and slip fitters shall be bronze. Traffic signal frameworks, heads, framework, pedestrian housings, clamshell, and pedestrian button housing shall be factory powder coated matte black per these special provisions and all shall be furnished and installed by the contractor.

"Knock Out" type seals are not acceptable for sealing unused pipe thread connections to terminal compartments, or top/bottom of signal heads. Connections shall be sealed with threaded fittings with a rubber gasket, or by the use of an "ornamental cap" designed for such purpose.

The Contractor shall exercise care at the time the signal heads are installed to insure 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 back plates shall be louvered with 5-inch border and shall be aluminum, unless otherwise indicated on the Project Plans. All back plates shall be powder coated fat black or matte black.

Signal visors shall be aluminum (12" diameter X 12" depth), shall be tunnel type and shall be powder coated fat black or matte black.

Signal heads and frame work, as a unit, shall be installed by the Contractor at the job site. Extreme care shall be taken by the Contractor's workers during the installation of the signals, frame works, and heads. Any scarred marks or cosmetic damage to the equipment caused from tools or installation processes shall be cause for rejection and shall be replaced at the expense of the Contractor.

(86-4.01D) Light Emitting Diode Signal Module Specifications

Purpose

The purpose of this specification is to provide the minimum performance requirements for 12 inch circular (ball and arrow), "walking person", "upraised hand" icons and 16X18 inch countdown pedestrian signal modules. This specification refers to definitions and practices described in "Vehicle Traffic Control Signal Heads (VTCSH): Light Emitting Diode (LED) Circular Signal Supplement", "Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement" and "Pedestrian Traffic Control Signal Indicators" (PTCSI): Light Emitting Diode (LED) Signal Modules, as published by The Institute of Transportation Engineers. They may be purchased online from www.ite.org. The contractor shall furnish and install all LED modules as shown on the plans.

General

- Referenced vehicle type LED modules shall fit in all standard, incandescent vehicle traffic signal housings.
- Circular ball LED signal modules shall contain no more than 18 LEDs.
- The modules may be used for the replacement of the reflector, socket, gasket, and lens assembly of existing warranty expired LED vehicle signal indication or may be used for

new installations.

- Each module shall consist of smooth lens with the same appearance and color as incandescent lenses.
- Each module shall consist of LED circuit board inclusive of all the LEDs and required circuit components.
- Each module shall have a rigid housing for protection in shipping, handling and installation.
- Each module shall have a one-piece neoprene gasket.
- The power supply shall be integral to the LED module and shall be one piece.
- 36 inch 16-18 AWG wire shall have leads with quick connect insulated terminals and also be provided with quick connect to fork terminal adapters.
- Lens type for green, yellow and red vehicular indications (ball and arrow) shall be tinted.

LED modules covered by this specification include the following types and all modules shall be "Dialight Hi-Flux LED" type or approved equal.

- 12 inch Circular Red
- 12 inch Circular Yellow
- 12 inch Circular Green
- 12 inch Circular Red Arrow
- 12 inch Circular Yellow Arrow
- 12 inch Circular Green Arrow
- 16"X18" Countdown Pedestrian Modules

Contractor shall provide exact catalog number for each module provided.

Identification and Labeling

Each individual LED signal module shall be identified for Warranty purposes and clearly marked with:

- Manufacturer's name
- Date of manufacture
- Nominal operating voltage
- Unit serial number
- Operating voltage
- Power consumption in Watts. No indication may exceed 20 watts
- Manufactured in Conformance with the ITE LED Circular Signal Supplement, June 27, 2005
- Manufactured in Conformance with the ITE LED Vehicle Arrow Traffic Signal Supplement, July 1, 2007
- Manufactured in Conformance with the ITE LED Pedestrian Traffic Signal Modules, August 4, 2010

Certification and Testing Standards

- All 12 inch circular LED Signal Indications shall fully and completely comply with all

sections of ITE VTCSH LED Circular Supplement specifications dated June 27, 2005.

- All 12 inch Arrow LED Signal Indications shall fully and completely comply with all sections of ITE VTCSH LED Vehicle NTOW Traffic Signal Supplement dated July 1, 2007.
- All 16 inchX18 inch Countdown Pedestrian Signal Modules shall fully and completely comply with all sections of ITE PTSCI LED Pedestrian Traffic Signal Module Specifications dated August 4, 2010. Modules shall be fully compliant with CAMUTCD 2003 Section 4E.07 and be fully preemption compatible. The modules shall include a 6" visor. The modules shall countdown the flashing "Don't Walk" prior to clearance interval and shall fit into existing 16" traffic signal housing built to PTSCI standards without modification to the housing. They shall require no special wiring or electronic modules to operate.
- All indications shall be tested to be in full compliance to all sections of the ITE VTCSH & PTSCI standards without exceptions and reports for each module shall be provided by the third party tester. Test report must list the LED manufacturer's model number and the model number must match the bid model number.

Optical Visibility

All LED Arrow modules shall be OMNI-DIRECTIONAL. That is, an LED traffic signal module that provides the same luminous intensity signal to the driver regardless of the orientation of the arrow icon or placement of the circular indication.

Warranty

- ALL LED traffic signal modules supplied shall be warranted for five (5) years against manufacturing defects.
- Failures due to acts of God, abuse, and accidents are excluded from warranty coverage.
- Vendors expressly warrant that all modules furnished shall be new, and shall be free from defects in material or workmanship.
- Vendor shall replace or correct defects if any modules not conforming to the foregoing warranty promptly, without expense to the City, when notified of such non-conformity by the City.
- In the event of failure of Vendor to correct defects in or replace non-conforming modules promptly, City, after reasonable notice to the Vendor, may take such corrections or replace such modules and charge Vendor for the cost incurred by the City in doing so.
- For each defective module returned, one new module shall be returned to the City. Vendor shall pay shipping for both ways for modules found to be defective and under warranty.
- Warranty shall commence from date of receipt of the modules by the City.

(86-4.02)Programmed Visibility Vehicle Signal Faces

Programmed visibility signal face and its installation shall comply with section 86-4.01, section 86-4.04, and the following requirements:

- Power to signal heads shall be automatically removed when rear door is opened.
- Have a nominal 12 inch diameter circular or arrow indication.
- Comply with ITE publication ST-017B for color and arrow configuration.
- Shall have a cap visor.
- Shall be mountable with ordinary tools and capable of servicing without tools.

- Shall have an adjustable connection that provides incremental tilting from 0 to 10 degrees above or below the horizontal while maintaining a common vertical axis through couplers and mountings.
- Visibility of each programmed visibility signal face shall be capable of adjustment or programming, within the face. When programmed, each signal face's indication must be visible only in those areas or lenses to be controlled except that during dusk and darkness a faint glow to each side is allowed.
- A signal technician qualified to program the programmed visibility signal heads shall be present when signal heads are placed in operation.
- Programmed visibility signal heads shall be programmed as recommended by the manufacturer.

(86-5.01) Vehicle Detectors

Vehicle detectors shall comply with the following requirements:

- A minimum of one (1) sensor unit shall be provided for each traffic phase shown on the plans. In addition, separate sensor unit lead-in cable shall be provided for each sampler loop, exclusive right-turn lane, and call loop set.
- Loop wire shall be Type 2 with THWN insulation (IMSA 51-5 or equivalent). Lead-in cable shall be Type C, 16 AWG stranded (IMSA 50-2 or equivalent).
- All front line loops shall be type "D" loop detector and the remaining loops shall be "Type E loop detector Configuration", per Caltrans Standard Plan ES-5B. All front line loops shall be placed one (1) feet behind stop bar/limit line. Additional loops behind the stop bar loop shall be spaced at 16 feet center to center, unless otherwise specified on the plans or specifications.
- All advance loops shall be type "E".
- Bike loop shall be placed one (1) feet behind stop bar/limit line. Bike loop shall be modified type "D" (6'*3') as shown in Appendix "A".
- All loops shall be installed underneath the pavement with pavement rehabilitation projects unless otherwise specified on the plans or specifications.
- All circular loops shall be saw-cut. The sides of the slot shall be vertical with a maximum width of 5/8 inch.
- All loop saw cuts shall be filled with Crafcro or approved equivalent hot applied modified asphalt sealant for pavement cracks and joints. Excess loop filler shall not exceed 1.5 inches on each side of saw cut.
- All loop sealant when installed in the final lift of the asphalt, the sealant shall be placed in a neat bead like a marmor, not to exceed 1/16" of an inch above the new asphalt. Special care shall be taken not to spill over the edge of the loop saw cut.
- Curb terminations shall be per Type A Curb Termination Detail, ES-5D of the State Standard Plans.
- Splicing of loop wires/DLC's shall not be allowed in pull boxes that contain traffic signal conductors. Separate pull boxes shall be installed for loop wires/DLC's.
- Insulation resistance of the loops shall be measured prior to sealing. Final resistance to ground shall be greater than 500 Megohms.

(86-5.02) Pedestrian Push Button Assemblies

Pedestrian push button assemblies shall comply with the following requirements:

- Push button shall be “Polara Bulldog III” or approved equal.
- Shall meet or exceed all ADA and CAMUTCD-2014 accessibility guidelines.
- Shall have 2” (minimum) activator button.
- Shall be furnished and installed by the contractor with all required fixtures and accessories to operate in momentary or latching mode.
- Operating temperature range: -34° C to +74° C (-30° F to +165° F)
- Operating force of less than 2.5 lbs and a minimum release force of 3 lbs.
- Telescoping, tamper-proof design.
- Stainless steel plunger and components.
- Dustproof, water resistant switch tested to 10 million cycles.
- Shall require no additional wiring to each button (only two wires).
- Powder coated black finish on switch housing unless otherwise specified by the Engineer.

5x7 Pedestrian Push Button Frame Assembly

The following requirements shall apply:

- House pedestrian push button cap and switch and most brands of pedestrian push buttons.
- House a standard 5”*7” pedestrian push button sign (see attached in Appendix “A”) or as shown on the plans.
- Manufactured of die cast aluminum.
- Provide with Philips head mounting screws.
- Powder coated black
- Fits traffic signal poles and pedestrian push button posts with diameter of 2-1/2” or greater.

2 Wire Accessible Pedestrian Signal (APS System)

Pedestrian signals and pedestrian detectors (pushbuttons) shall conform to the accessible pedestrian signal (APS) requirements of these Technical Specifications and shall be installed as shown on the plans. All APS and push buttons shall be furnished and installed by the Contractor. For all new signal project, signal modification project, curb ramp enhancement project, and any project involving replacement of existing pedestrian push button shall use APS system only. All APS and push buttons shall be Polara brand or approved equal.

System Description

The Audible-Tactile Pedestrian Signal System shall consist of all electronic control equipment, mounting hardware, push buttons and signs, which are designed to provide both a push button with a raised vibrating tactile arrow on the button, along with a variety of audible sounds for different pedestrian signal functions.

Substantiating documentation for meeting ISO, NEMA, IEC, and FCC requirements must be supplied from an outside Testing Services Laboratory.

General Description

1. The System shall consist of a Central Control Unit (CCU) and Pedestrian Push Button Stations (PBS), as described below, and an iOS device w/ the iOS client application or Windows PC with BLE dongle and Windows client application, for programming the system settings.
2. The System shall be manufactured by an ISO 9001:2008 (minimum) registered company.
3. The System shall meet the requirements of Made in America and/or The Buy American Act.

Design Compliance

1. The System shall meet the functionality requirements of MUTCD 2009 – 4E and CAMUTCD 2011 – 4E.
2. The System shall meet NEMA TS 2 Section 2.1 Temperature & Humidity requirements, or TS4 equivalent.
3. The System shall meet NEMA TS 2 Section 2.1 Transient Voltage Protection requirements, or TS4 equivalent.
4. The System shall meet NEMA TS 2 Section 2.1 Mechanical Shock and Vibration requirements, or TS4 equivalent.
5. The System shall meet IEC 61000-4-4, IEC 61000-4-5 Transient Suppression requirements.
6. The System shall meet FCC Title 47, Part 15, Class A Electronic Noise requirements.
7. The Push Button Station (PBS) Enclosure shall meet NEMA 250 – Type 4X requirements.
8. The Central Control Unit (CCU) Enclosure shall meet NEMA 250 – Type 1 requirements.

Functional Requirements

1. The System shall support at least 16 PBS's per intersection (on at least 1 channel) controlled by a single base unit located in the traffic control cabinet.
2. The System shall be able to be set to vibrate a tactile arrow button during the WALK interval following a button push and/or every time the walk comes up.
3. The System shall have the field-selectable function known as "LOCATE TONE". This means that during the FLASHING DON'T WALK and the DON'T WALK intervals, the system shall provide a locating tone that emanates from the Pedestrian Push Button Station. The system shall provide at least 3 different sounds to choose from.
4. The System shall have the field selectable function known as "Extended Push Activation". This is defined as the audible WALK message shall only be activated and audible during the WALK interval if the button is depressed for a field selectable minimum period of time (from 0.5 to 6 seconds). Also, for the following walk and

clearance intervals, the volumes have a separately settable minimum and maximum volume level.

5. The System shall have the field selectable function known as “Informational Message”. This means that a custom message giving the location of the street to cross and the intersection (or other information) will be vocalized only when the button is depressed for a minimum field selectable time.
6. The System shall provide a “Wait” message that plays once the button is activated until the Walk cycle goes into effect. This message must have the field selectable option of OFF or repeating every 4, 6, 8 or 10 seconds.
7. The System shall have standard “Travel Direction” options that may be selected at the time of installation.
8. The System shall have at least 10 field selectable WALK sound options including a cuckoo, a chirp, an MUTCD rapid tick or custom voice message.
9. The System shall provide at least 7 Ped-clearance sound choices including audible countdown (field selectable). The audible countdown shall represent the time remaining during the pedestrian Clearance interval. Timing is automatically adjusted to the CLEARANCE INTERVAL timing, provided by the traffic controller.
10. The System shall provide 2 language capabilities, selectable by user (as a field selectable feature).
11. The System shall provide an Emergency preemption message in conjunction with a preemption system (selectable feature).
12. The system LOCATE TONE, WALK, and DON'T WALK audible features shall have independent assignable minimum and maximum volume limits. CLEARANCE volume level shall be controlled by WALK volume setting.
13. All sounds for all PBS's shall be synchronized.
14. The system shall have a non-visible, ambient sensing microphone located in the pedestrian station in an environmentally protected housing.
15. The LOCATE TONE volume shall adjust automatically in response to ambient noise with field selectable adjustment levels from -30dB below to +20dB above ambient in 2.5dB increments.
16. All other sounds volumes shall adjust automatically in response to ambient noise with field selectable adjustment levels from -30dB below to +20dB above ambient in 5dB increments.
17. The system shall utilize high quality digital audio technology, with a minimum 16-bit sample at a 48 kHz sample rate.
18. The PBS firmware and voice messages shall be updatable via Bluetooth. There shall be no requirement for the IC chips or module hardware to be removed or exchanged in order to complete a firmware or audio update.
19. The System shall have the option to mute sounds on all crosswalks except activated crosswalk (selectable feature).
20. The System shall have a real time clock capable of keeping time when there is no system power, for at least 2 years from the date of manufacture.
21. The System shall have the ability to have four separate program configurations with all features available, and any single configuration can be selected through an external input.

22. The System shall provide a user settable calendar function, allowing four separate configuration profiles to be configured to become active at different times of the day on a daily, weekly, or holiday basis.
23. The entire System shall be configurable from any PBS over Bluetooth.
24. The entire System shall be configurable from the CCU over Wi-Fi or Ethernet.
25. All field access to selectable options using a Bluetooth, Wi-Fi or Ethernet devices shall be protected using password security.

Central Control Unit (CCU)

1. The CCU-S shall be installed inside the Traffic Cabinet and powered by the AC supply mains (115 VAC).
2. The CCU will provide data for the push buttons.
3. The CCU shall be either a shelf mount (CCU-S) or rack mount (CCU-C) assembly
4. The CCU-C shall be installed inside the 300 series Traffic Cabinet's Input File, replacing 2 PED isolator boards and receiving power from the rack (24VDC).
5. The CCU-S shall provide internal power to operate up to 16 PBS's.
6. A 24 volt power brick shall power up to 16 PBS's in a CCU-C configuration.
7. The CCU shall control at least 16 PBS's.
8. The CCU shall be logically configurable to assign any PBS to one of 16 traffic phases.
9. The CCU-S shall receive pedestrian phase Walk, Don't Walk and Clearance inputs from either the traffic cabinet load switches or an SDLC input.
10. The CCU-C shall receive pedestrian phase Walk, Don't Walk and Clearance inputs from a Transport Electrical Equipment Specification (TEES) C4S connector.
11. The CCU shall be able to self-test all PBS's and put a corresponding phase into recall should a PBS assigned to a phase fail the self-test.
12. The CCU-S shall provide optically isolated general purpose inputs.
13. The CCU-S shall be used with a 4-cable interface harness assembly.
14. The CCU shall have internal storage to log several hundred events with a date-time stamp for each event.
15. The CCU shall have an internal real-time clock capable of being set in the field and propagating the time to each connected PBS.
16. The CCU firmware shall be updatable via either Wi-Fi or Ethernet. There shall be no requirement for the IC chips or module hardware to be removed or exchanged in order to complete the firmware update.
17. The CCU shall monitor PED interval conflicts and signal affected PBS's to an off state when a conflict occurs.
18. The CCU-S shall meet NEMA 250 – Type 1 enclosures requirements.
19. The CCU shall have a backlit LCD screen and button interface to allow placing test calls and display status.

Pedestrian Push Button Station (PBS)

1. The PBS shall be mounted to a pole by banding or bolting.
2. The PBS will allow the pedestrian to place calls to the traffic controller and provides vibro-tactile feedback during the Walk cycle.
3. This equipment shall be typically mounted on a pole, near the start of the crossing.

4. The PBS shall be a single fixture that contains a 2" activation area, in which resides an ADA compliant vibro-tactile push button with a raised directional tactile arrow, and a sign mounted above the button.
5. The PBS Speaker shall be 8 Ohms, 6 Watt, and weather-proof.
6. The button shall be cast aluminum, nickel-plated and powder coated black around the arrow, to provide high contrast to arrow color. The PBS arrow shall allow for change in orientation to one of four directions.
7. The PBS Arrow Button Actuation shall use Hall Effect Sensor technology rated to greater than 20 million operations.
8. The PBS Arrow Button Push Force shall have three adjustable pressure settings between approximately 1 and 3lbs to activate a button push.
9. The PBS Arrow Button shall pulse and vibrate at approximately 20 Hz with displacement factor based on pounds of force used to actuate.
10. The PBS shall have a rear facing speaker projecting sound from front and back, providing 360° omnidirectional sound performance.
11. The PBS shall include internal Conflict Monitoring that monitors WALK, and DON'T WALK input signals for conflict conditions; disables system operation and logs errors if conflict occurs.
12. The PBS firmware and voice messages shall be updatable via Bluetooth. There shall be no requirement for the hardware to be changed out to update.
13. The system shall operate with the vendor's client application to record and upload cumulative ped count & call data.
14. The PBS shall meet or exceed NEMA 250 type 4X enclosure requirements.
15. The PBS Construction shall be:
 - I. FRAME: Cast Aluminum, Powder Coated Black.
 - II. HOUSING: Reinforced, UL-listed Thermoplastic.
 - III. MESSAGE SIGN: Aluminum, Powder Coated, Ink Markings, or Reflective Vinyl Sheeting
 - IV. PUSH BUTTON: Aluminum, Powder Coated.
16. Electronic circuits (printed circuit board assemblies) shall be in a water-tight housing/enclosure or encapsulated with a thermoplastic polyamide having a UL94-V0 flammability rating and allowing light and RF transmissions (i.e. over-molded), for environmental protection. The housing/closure or encapsulation shall be capable of providing NEMA 250 4X protection to all covered components.
17. The PBS Message Marking at the time of order may specify the Message Sign Markings to be the International Walking Person or the Informational Explanations for the three (3) distinct pedestrian displays (WALK, DON'T WALK, and PED CLEAR) that a pedestrian would see on an active pedestrian signal.
18. Push button station frame shall be capable of holding a 5"*7-3/4" or larger pedestrian sign (see attached in Appendix "A" for detail) or as shown on the project plans.
19. The clearance between center of the installed push button and finished grade shall be 40" or as shown on the project plans.

Field Programming via Client Application (Apple iOS v8.0 or higher devices or a PC with Windows 7, 8 or 10)

1. The iOS and PC applications shall be upgradable.

2. The iOS and PC applications shall notify the user when a newer version of the client application is available.
3. The iOS and PC applications shall notify the user when newer PBS and CCU firmware is available.
4. The iOS and PC applications shall provide the mechanism to download the latest PBS and CCU firmware.
5. The iOS and PC applications shall be capable of setting all volumes and features of the APS system specific to the PBS's.
6. The iOS and PC applications shall be capable of setting/updating configuration options for a single PBS or all PBS's on the intersection for most functions from a single PBS or CCU. (Global updating).
7. The iOS and PC applications shall be capable of storing, modifying, loading, and emailing PBS configuration settings.

Warranty

Each piece of APS equipment shall have a full three (3) years warranty from the date of delivery to the City corporation yard. This includes all associated fixtures. The Contractor shall be responsible for replacement or repair of any defective part of the APS for the entire period of the warranty.

(86-6) Lighting

Induction Luminaires

These specifications applied to supply and install complete functional new induction luminaire lighting fixtures (cobra head style) with cut-off optics and shall be installed to provide lighting on streets only.

Induction Equipment(Street Lighting Only)

- The new induction luminaire lighting fixtures shall be completely new (no refurbish) and comprised of the three components: the generator, the power coupler and the lamp including flat lens and all required accessories to be fully functional.
- The lamp wattages shall 60w, 80w, 120w, 200w or as shown on the plans.
- Power factor shall be .98.
- Total Harmonic Distortion (THD) shall be less than 10%.
- The lamps shall be rated to last 100,000 hrs.
- The Kelvin color temperature for full spectrum lighting shall be between the ranges of 4700 and 5000K.
- The color rendering index shall be 85.
- The lumens per watt shall be 95.
- The range of operating temperature shall be between -31°F and 194°F.
- The voltage shall be 120V/277V.
- All street lights shall be fused in the pull box using a Copper Bussman inline fuse holder with rubber boots and 10 amp fuses.

Warranty

- Each piece of induction lighting equipment shall have a full ten (10) years warranty. This includes all associated fixtures. The Contractor shall be responsible for replacement or

repair of any defective part of the induction lighting fixture for the entire period of the warranty.

Installation

- All street light poles, mast arms, pole foundations, conduits, pull lines, wiring, induction luminaires, and pull boxes shall be subject to inspection by the City.
- All street light poles, mast arms, pole foundations, conduits, pull lines, wiring, induction luminaires, and pull boxes shall be furnished and installed by the contractor.
- The contractor shall install street lights and underground service to the PG&E service point and terminate conduit and wiring in pull boxes as shown on the project plans.
- All street light fixtures shall have a Type IV photoelectric control (minimum rated life of 12 years) mounted on top of each luminaire, the top of each pole or as specified by the Engineer.
- A certificate of compliance shall be required for all material prior to delivery at the project site.
- All street light poles to be installed outside of downtown area shall be galvanized.
- All street poles to be installed within the downtown area, shall be powder coated (minimum two coats) "TIGER Drylac Powder Coatings" Super durable 038/80020, Jet Black, SAT/SM, 35min338F/170C-15min392F/200C, B.:773276598 (www.tiger-coatings.com, www.tiger-coatings.us, 1-800-243-8148) or Valmont Color: Jet Black RAL 9005, Valmont Specification: F540DO (1-800-825-6668).
- All street lighting/safety lighting wiring shall Type THW AWG #8 copper wire.
- All street light standards shall have a No. 3.5 pull box adjacent to the foundation facing away from the traffic unless otherwise shown in the plans.
- Anchor bolts shall be set as close as possible to the finish grade, while still maintaining a level pole.
- The contractor shall be responsible for receiving (from PG&E) and attaching reflective identification to each installed pole

Light Emitting Diode (LED) Luminaires

These specifications applied to supply and install complete functional new LED luminaire lighting fixtures (cobra head style) with cut-off optics and shall be installed at signalized intersections only. LED luminaires shall be LEO – TEC brand or approved equal.

LED Equipment (Safety Lighting Only)

- Luminaire shall not weigh more than 22 lbs or as approved by the Engineer.
- Shall consist of a heat sink with no fans, pumps, or liquids and shall be resistant to debris buildup that does not degrade heat dissipation performance.
- Shall provide option for field installable house side light control.
- Shall be primarily constructed of metal (aluminum). Finish shall be gray in color, powder coated and rust resistant.
- Driver shall be mounted internally, shall be replaceable and shall be accessible without tools.
- All screws shall be stainless steel. Captive screws or use of latches are needed on any compartments that require maintenance after installation.

- No parts shall be constructed of polycarbonate unless it is UV stabilized (lens discoloration shall be considered a failure under warranty)
- Spectrum shall have no Ultra Violet (UV).
- Turn on time shall be <0.1 sec.
- Total Harmonic Distortion (THD) shall be less than 10%.
- The lamps shall be rated to last 100,000 hrs.
- The Kelvin color temperature for full spectrum lighting shall be between the ranges of 3200 and 5600K.
- The color rendering index shall be minimum 70.
- The lumens per watt shall be minimum 90 or as approved by the Engineer.
- The power supply shall operate between -40°F and 165°F.
- The voltage shall be 100V/277VAC.
- The lamp wattage shall be 150w or as shown on the plans.
- Power factor shall be minimum .90.
- Power supply shall have a Class A sound rating per ANSI Standard C63.4. Assembly or compartment shall be rated a minimum of IP54.
- Output operating frequency shall be greater than or equal to 120 Hz (to avoid visible flicker) and input operating frequency of 60Hz.
- Transient protection shall be per IEEE C.62.41-2-2002, Class A operation. The line transient shall consist of seven strikes of a 100k HZ ring wave, Min. 10 kV level, for both common mode and differential mode.
- The power draw of the luminaire (including PE or remote control devices) shall not exceed 2.50 watts when in the off state.
- Power supplies shall meet FCC 47 CFR Part 15/18 (consumer Emission Limits).
- Power supply shall have a Class A sound rating per ANSI Standard C63.4.
- LED module(s)/array(s) shall deliver at least 70% of initial lumens. When installed for a minimum of 50,000 hours. Assembly shall be rated a minimum of IP66.
- Lighting distribution shall be Type II or Type III in accordance with IESNA Lighting Distributions or as approved by the Engineer.
- Each luminaire shall have a Bar Code identifying its catalog number, wattage and current settings of 700mA, 525mA, or 350mA. Bar Code is required to be attached on the inside of housing door and must be easily visible once door is opened.
- Photocell shall be specifically designed for use with LED luminaires. 120-277v, fail on energy saver turn-on, ANSI category C surge protection.
- All safety lightings shall be fused in the pull box using a Copper Bussman fuse holder with rubber boots and 10 amp fuses.

Warranty

- Each piece of LED safety lighting equipment shall have a full ten (10) years warranty. This includes all associated fixtures. The Contractor shall be responsible for replacement or repair of any defective part of the LED safety lighting fixture for the entire period of the warranty.

Photo Electric Controls

Photoelectric control shall be Type IV weatherproof single voltage photoelectric relay with instant on/off twist lock receptacle integral with the luminaire head rated at 120 volts, 2.6 fc turn on level, and 2160 joules surge protection with a 12 year service life. Photo cell receptacle for LED luminaires shall have a 7-pin per ANSI C136.41. Warranty for photo electric control shall be minimum 10 years.

Pre-emption Equipment

The Contractor shall furnish and install required optical detectors, rack(s), four (4) multimode phase selectors and cables, etc., (complete and operable) as shown on the plans and according to the manufacturer's recommendations.

All optical detectors shall be mounted on the MAS signal heads. Mounting shall comply with the requirements as specified in 2015 Standard Plan ES-4E. The Engineer will mark the optical detector location for the Contractor. The Contractor shall notify the Engineer at least 48 hours prior to installing the optical detector.

Mounting of the optical detector on a ¾ inch diameter conduit stub shall conform to the following:

- Type 1 Standards - If necessary, retrofit signal framework and hardware.

Optical detectors shall be 3M, Type 721 or approved equal, and shall be compatible with the City's and Contra Costa County Consolidated Fire Prevention District's (CCCCFPD) requirements.

Cable shall be Opticom Model 138 detector cable including Opticom span wire clamp or approved equal, and shall be installed with six feet of slack in controller cabinet and pull boxes. The cable shall not be spliced.

Optical cables shall be labeled in the controller cabinet and in the pull boxes adjacent to the signal standards with appropriate phase designations.

Multimode phase selector shall be "Opticom "Model 764" or approved equal.

The City and/or the CCCCFPD will test the optical system. Tests will be performed at a distance between 300 feet to 1,800 feet between the emitter and the detector being tested.

Video Imaging Vehicle Detection System

The contractor shall furnish and install the required number of video detection cameras at project locations as shown on the plans. The video detection camera shall be GRIDSMART Video Imaging Vehicle Detection System (VIVDS) or approved equal. The system shall be installed on the luminaire mast arm or as shown on the plans. The detection system shall comply with the specifications outlined below.

1. Description

Install a Video Imaging Vehicle Detection System (VIVDS) that monitors vehicles on a roadway via processing of video images and provides detector outputs to a traffic controller or similar device.

A VIVDS configuration for a single intersection will consist of either 1 or 2 fixed focal length omnidirectional view cameras or the VIVDS PROCESSOR.

The system shall be composed of these principal items: the camera(s), the field communications link consisting of a single CAT5e cable between each camera and the VIVDS Processor, and the VIVDS PROCESSOR along with a PC, video monitor or

associated equipment required to setup the VIVDS PROCESSOR and software to communicate to the VIVDS PROCESSOR.

The VIVDS PROCESSOR must be either NEMA TS 2 TYPE 1 or TYPE 2. TYPE 2 must have RS 485 SDLC. The VIVDS PROCESSOR must have at least four (4) processing cores of 2.8GHz or greater, a minimum of 3GB random access memory (RAM), and at least 32GB of onboard storage.

2. Definitions

- A. VIVDS PROCESSOR. The electronic unit that converts the video image provided by the cameras generates vehicle detections for defined zones and collects vehicular data as specified.
- B. Central Control. A remotely located control center, which communicates with the VIVDS PROCESSOR. The VIVDS operator at the central control has the ability to monitor the operation and modify detector placement and configuration parameters. The equipment that constitutes central control is comprised of a workstation microcomputer along with the associated peripherals as described in this special specification.
- C. Field Setup Computer. A portable microcomputer used to set up and monitor the operation of the VIVDS PROCESSOR. If required to interface with the VIVDS processor unit, the field setup computer with the associated peripherals described in this special specification and a video monitor, also described in this special specification, must be supplied as part of the VIVDS.
- D. Field Communications Link. The communications connection between the camera(s) and the VIVDS PROCESSOR. This link will consist of one CAT5e cable for each omnidirectional camera.
- E. Remote Communications Link. The communications connection between the VIVDS PROCESSOR and the central control.
- F. Camera Assembly. The complete camera or optical device assembly used to collect the visual image. The camera assembly consists of a CMOS camera, environmental enclosure, temperature control mechanism, and all necessary mounting hardware.
- G. Occlusion. The phenomenon when a vehicle passes through the detection zone but the view from the sensor is obstructed by another vehicle. This type of occlusion results in the vehicle not being detected by the sensor.

Or

When a vehicle in one lane passes through the detection zone of an adjacent lane. This type of occlusion can result in the same vehicle being counted in more than one lane.

- H. Detection Zone. The detection zone is an area selected through the VIVDS PROCESSOR that when occupied by a vehicle, sends a vehicle detection to the traffic controller or freeway management system.
- I. Detection Accuracy. The measure of the basic operation of a detection system (shows detection when a vehicle is in the detection zone and shows no detection when there is not a vehicle in the detection zone).
- J. Live Video. Video being viewed or processed at 5 to 10 frames per second.

- K. Lux. The measure of light intensity at which a camera may operate. A unit illumination equal to one lumen per square meter or to the illumination of a surface uniformly one meter distant from a point source of one candle.

3. Functional Capabilities

The system software must be able to detect either approaching or departing vehicles in multiple traffic lanes. A minimum of 24 detector outputs per VIVDS PROCESSOR. Each zone and output must be user definable through interactive graphics by drawing arbitrarily shaped polygons using the Field Setup Computer or Central Control. The user must be able to redefine previously defined detection zones.

The VIVDS PROCESSOR must provide real time vehicle detection (within 500 milliseconds (ms) of vehicle arrival).

The system must be able to detect the presence of vehicles in up to 64 detection zones per camera.

Detection zones must be provided that are sensitive to the direction of vehicle travel. The direction to be detected by each detection zone must be user programmable.

The VIVDS PROCESSOR unit must compensate for minor camera movement (up to 2% of the field of view at 400 ft.) without falsely detecting vehicles. The camera movement must be measured on the unprocessed video input to the VIVDS PROCESSOR.

The camera must operate while directly connected to VIVDS Processor Unit.

Once the detector configuration has been downloaded or saved into the VIVDS PROCESSOR, the video detection system must operate with the monitoring equipment (monitor and/or laptop) disconnected or on-line.

When the monitoring equipment is directly connected to the VIVDS PROCESSOR, it must be possible to view vehicle detections in real time as they occur on the field setup computer's color VGA display or the video monitor.

The VIVDS PROCESSOR must support 1 or 2 omnidirectional view cameras. If equipped with 1 omnidirectional view camera, the VIVDS processor must also be capable of simultaneously supporting up to four (4) more traditional view cameras for special needs such as advance detection or underpass detection.

4. Vehicle Detection

A. Detection Zone Placement: The video detection system must provide flexible detection zone placement anywhere within the combined field of view of the image sensors. Preferred presence detector configurations shall be arbitrarily shaped polygons, including simple boxes drawn across lanes of traffic or placed in line with lanes of traffic. A single detector must be able to replace one or more conventional detector loops.

B. Detection Zone Programming: Placement of detection zones must be by means of a graphical interface using the video image of the roadway. The monitor must show images of the detection zones superimposed on the video image of traffic while the VIVDS PROCESSOR is running. The displayed zones, when operating, must be able to be displayed outlined or filled, with a visible change indicating detection.

The detection zones must be created by using the mouse or keypad to draw detection zones on the monitor. The detection zones must be capable of being sized and shaped to provide optimal road coverage and detection. It must be possible to upload detector

configurations to the VIVDS PROCESSOR and to retrieve the detector configuration that is currently running in the VIVDS PROCESSOR.

The mouse or keypad may be used to edit previously defined detector configurations so as to fine tune the detection zone placement size and shape. Once a detection configuration has been created, the system must provide a graphic display of the new configuration on its monitor. While this fine-tuning is being done, the detection must continue to operate from the detector configuration that is currently called.

When a vehicle occupies a detection zone, the detection zone on the live video must indicate the presence of a vehicle, thereby verifying proper operation of the detection system. With the absence of video, the VIVDS PROCESSOR must have a display that will indicate proper operation of the detection zones.

Detection zones must be provided that are sensitive to the direction of vehicle travel. The direction to be detected by each detection zone must be user programmable. The vehicle detection zone should not activate if a vehicle traveling any direction other than the one specified for detection occupies the detection zone. Cross-street and wrong way traffic should not cause detection.

Detection zones must have the option for the user to define that calls can be made with a side entrance (90° or less angled entrance).

C. Design Field of View: The video detection system must reliably detect vehicle presence in the design field of view. The design field of view must be defined as the sensor view when the image sensor is mounted 30 ft. or higher above the roadway, when the camera is adjacent (within 15 ft.) to the edge of the nearest vehicle travel lane, and when the length of the detection area is not greater than 5 times the mounting height of the image sensor. Within this design field of view, the VIVDS PROCESSOR unit must be capable of setting up a single detection zone for point detection (equivalent to the operation of a 6 ft. by 6 ft. inductive loop). A single camera, placed at the proper mounting height, must be able to monitor up to and including 5 traffic lanes simultaneously. A single omnidirectional camera, placed at the proper mounting height, must be able to monitor detection zones in at least intersection approaches.

D. Detection Performance: Detection accuracy of the video detection system must be comparable to properly operating inductive loops. Detection accuracy must include the presence of any vehicle in the defined detection zone regardless of the lane, which the vehicle is occupying. Occlusion produced by vehicles in the same or adjacent lanes must not be considered a failure of the VIVDS PROCESSOR, but a limitation of the camera placement. Detection accuracy (a minimum of 95%) must be enforced for the entire design field of view on a lane by lane and on a time period basis. When specified in the plans, furnish up to 24 continuous hours of recorded video of all installed intersection cameras within the 30 day test period for verification of proper camera placement, field of view, focus, detection zone placement, processor setup and operation. The video from each camera must show vehicle detections for all zones.

E. Equipment failure: Either camera or VIVDS PROCESSOR, must result in constant vehicle detection on affected detection zones.

5. VIVDS PROCESSOR

A. Cabinet Mounting: The VIVDS PROCESSOR is shelf mountable.

B. Environmental Requirements: The VIVDS PROCESSOR must be designed to operate reliably in the adverse environment found in the typical roadside traffic cabinet. It must

meet the environmental requirements set forth by the latest NEMA (National Electrical Manufacturers Association) TS1 and TS2 standards as well as the environmental requirements for Type 170, Type 179 and 2070 controllers. Operating temperature must be from -30°F to +165°F at 0% to 95% relative humidity, non-condensing.

C. Electrical: The VIVDS PROCESSOR must have a modular electrical design.

The VIVDS PROCESSOR must operate within a range of 89 to 135 VAC, 60 Hz single phase. Power to the VIVDS PROCESSOR must be from the transient protected side of the AC power distribution system in the traffic control cabinet in which the VIVDS PROCESSOR is installed.

Communications to the field setup computer must be through an Ethernet port. This port must be able to download the real time detection information needed to show detector actuations.

The VIVDS PROCESSOR must have an Ethernet connection on the front of the unit for the connection to the 1st camera. If a second camera is installed at the intersection, the camera will connect with the VIVDS PROCESSOR through a connector mounted on the side of the PROCESSOR.

The unit must be equipped with a single VGA video output. This output must be capable of displaying the operation and detections of the VIVDS PROCESSOR.

The change log for all Software upgrades and/or changes MUST be presented on a readily assessable internet site with unencumbered public access.

The unit software and the supervisor software must include diagnostic software to allow testing the VIVDS functions. This must include the capability to set and clear individual detector outputs and display the status of inputs to enable setup and troubleshooting in the field.

6. Camera Assembly

A. Camera: The video detection system must use high resolution, color image sensors as the video source for real time vehicle detection. The cameras must be approved for use with the VIVDS PROCESSOR unit by the supplier of the VIVDS. As a minimum, each camera must provide the following capabilities:

1. Images must be produced with a CMOS sensing element with horizontal resolution of at least 2580 lines and vertical resolution of at least 1920 lines. Images must be output in digital format as MJPEG image.
2. Useable video and resolvable features in the video image must be produced when those features have luminance levels as low 1.0 lux for color, for night use.
3. Useable video and resolvable features in the video image must be produced when those features have luminance levels as high as 10,000 lux during the day.
4. The camera must include an electronic shutter control based upon average scene luminance and must be equipped with fixed field of view and fixed focused lens which does not require opening the camera enclosure. The fixed focus lens must be always in focus without any required end-user adjustments.

. Camera and Lens Assembly: The camera and lens assembly must be housed in an environmental enclosure that provides the following capabilities:

1. The enclosure must be waterproof and dust tight to the latest NEMA 4 specifications.
2. The enclosure must allow the camera to operate satisfactorily over an ambient temperature range from -30°F to +165°F while exposed to precipitation as well as direct sunlight.
3. The enclosure must include a provision for connection of the CAT5e cable. Input power to the environmental enclosure must be included in the Ethernet interface.
4. A thermostatically controlled heater must be at the front of the enclosure to prevent the formation of ice and condensation. The heater must not interfere with the operation of the camera electronics, and it must not cause interference with the video signal.
5. The enclosure must be light colored or unfinished and must be designed to minimize solar heating. Any plastics used in the enclosure must include ultra violet inhibitors.
6. The total weight of the image sensor in the environmental enclosure must be less than 10 lb.

Use waterproof, quick disconnect connectors to the camera for the CAT5e connection.

A camera interface panel capable of being mounted to sidewalls of a controller cabinet must be provided for protection of the VIVDS PROCESSOR, camera CAT5e connection. The panel must consist of, as a minimum, 2 CAT5e cable surge protection connections.

When the connection between the camera and the VIVDS PROCESSOR is CAT5e cable, the cable used must be suited for outdoor installation.

Camera mounting hardware must allow for vertical or horizontal mounting to the camera enclosure.

7. Field Communication Link: The field communications link must be a two way communications connection from the camera to the VIVDS PROCESSOR. The primary communications link media must be burial grade CAT5e cable.

The following requirements must govern for the various types of field communications link media described on the plans:

- A. CAT5e Cable: In locations where the plans indicate CAT5e cable is required as the primary communications link, this cable must be burial grade as well as suitable for above ground applications.

All connection cables must be continuous from the equipment cabinet to the camera connector.

Install lightning and transient surge suppression devices on the processor side of the field communications link to protect the peripheral devices. The suppression devices must be all solid state. The devices must present high impedance to, and must not interfere with, the communications lines during normal operation. The suppression devices must not allow the peak voltage on any line to exceed 300% of the normal operating peak voltage at any time. The response time of the devices must not exceed 5 nanoseconds.

8. VIVDS Set-Up System: The minimum VIVDS set-up system, as needed for detector setup and viewing of vehicle detections, must consist of a field setup computer and Windows based interface software (if required) or a video monitor with interface software built-in to the VIVDS PROCESSOR. Live video (5 frames per second) must be available on the field setup computer to determine proper operation of detectors. The field set-up computer as a minimum must have a network connection.

If a field setup computer is required for system set-up, it must be supplied by the supplier of the VIVDS PROCESSOR.

The field setup computer must include all necessary cabling and a Windows based program to interface with the VIVDS PROCESSOR. This software must provide an easy to use graphical user interface and support all models/versions of the supplied VIVDS.

Live video with the detection overlaid is required for field verification of the system.

9. Temporary Use and Retesting:

- A. Temporary Use: When shown on the plans, the VIVDS equipment must be used to provide vehicle detection on a temporary basis. When the permanent vehicle detection system and related equipment are installed and made operational, the VIVDS equipment must be carefully removed and delivered to the location shown on the plans.

10. Operation from Central Control: The central control must transmit and receive all information needed for detector setup, monitor the vehicle detection, view the vehicle traffic flow and interrogate all required stored data. The remote communications link between the VIVDS PROCESSOR and central control may be dial-up (telephone or ISDN lines) or dedicated twisted wire pair communications cable which may be accompanied with coaxial cable or fiber-optic cable, as shown on the plans. Communications with the central control must not interfere with the on-street detection of the VIVDS PROCESSOR.

11. Installation and Training: The supplier of the video detection system must supervise the installation and testing of the video and computer equipment.

Instruction personnel are required to be certified by the equipment manufacturer. The User's Guide is not an adequate substitute for practical, classroom training and formal certification by an approved agency.

Formal levels of factory authorized training are required for installers, contractors and system operators. All training must be certified by the manufacturer.

12. Warranty, Maintenance and Support: The video detection system must be warranted to be free of defects in material and workmanship for a period of 3 years from date of shipment from the supplier's facility. During the warranty period, the supplier must repair with new or refurbished materials, or replace at no charge to the City, any product containing a warranty defect provided the product is returned FOB to the supplier's factory or authorized repair site. Return product repair or replaced under warranty by the supplier with transportation prepaid. This warranty does not apply to products damaged by accident, improperly operated, abused, serviced by unauthorized personnel or unauthorized modification.

Ongoing software support by the supplier must include updates of the VIVDS PROCESSOR and supervisor software (if a field setup computer is required for set up). Provide these updates free of charge during the warranty period.

The supplier must maintain a program for technical support and software updates following expiration of the warranty period.

The cost for furnishing, installing, maintaining, the video detection systems including wiring, as needed to comply with this specification shall be included in the lump sum price paid for Traffic Signal installation work and no additional compensation shall be allowed thereof.

Closed Circuit Television (CCTV) Camera Assembly

Description of Work

Work under this section shall include the installation of CCTV assemblies as indicated on the project plans.

Technical and Functional Requirements

The Contractor shall furnish and install CCTV assembly items ((Pan Tilt Zoom (PTZ) cameras, camera mounting brackets, and all cables for power and connection to communication equipment) at project location/locations as shown on the plans. The Contractor shall furnish and install new mountings at those locations as shown in the Project Plans, and shall furnish and install camera cables, and any additional equipment required for a complete and operational CCTV assembly. The CCTV assembly shall be installed such that the camera viewing coverage is optimized as directed by the Project Engineer. CCTV camera locations shall include termination to the existing or proposed communication system which is connected to existing fiber optic trunk or signal interconnect cable (copper wire) as shown on the plans.

In addition to the CCTV, the Contractor shall integrate the assembly into the city's existing ONSSI video management system.

Materials

CCTV camera assemblies shall be furnished by the contractor and shall include the following components:

1. Camera
2. Motorized zoom lens
3. Environmental enclosure with sun shield or shroud
4. Pan and tilt unit integrated with the Camera
5. Internet Protocol (IP) interface capabilities including Power Over Ethernet
6. Mounting bracket and mounting hardware
7. Pigtail power/data cable with quick connect/disconnect "amp style" connector
8. Power over Ethernet Injector/Power Supply

Any external cables must not interfere with or limit the continuous pan and tilt operation. The CCTV camera assembly must have all necessary wiring, cables, and connectors. All CCTV camera assemblies must be plug-compatible, interchangeable and suitable for use with the CCTV camera cable assembly described in the special provisions. Contractor must apply an approved weather-resistant spray to the inside of the connectors before engaging the connectors. CCTV camera assembly components must be rated for NEMA 4X, IP 68.

A description of the camera equipment to be furnished is provided below:

- BOSCH Camera Assembly (MIC IP Dynamic 7000 HD) or City-approved equal.
- Mounting hardware.
- Ground Loop Isolation Transformer.
- 24V DC Power Supply. Work under this item shall include

- Universal AC input / Full range
- PF>0.98@115VAC, >0.95@230VAC
- Installed on DIN rail TS35/7.5 or 15
- Protections: Short circuit / Overload / Over voltage / Over temp.
- Fixed switching frequency at 100 KHz
- LED indicator for power on
- Cooling by free air convection
- 100% full load burn-in test
- AC input voltage range.....85~264VAC; 120~370VDC
- AC inrush current.....Cold Start, 30A at 115VAC, 50A at 230VAC
- DC adjustment range.....24~28V for 24V model, 48~53V for 48V model
- Overload protection105%~150% constant current limiting, auto-recovery
- Over voltage protection.....30~36V for 24V model, 54~60V for 48V model
- Setup, rise, hold up time.....800ms, 40ms, 20ms at full load and 230VAC
- Withstand voltage.....I/P-O/P:3KVAC, I/P-FG:1.5KVAC, 1 minute
- Working Temperature.....-10~55°C@100%, 70°C@60% load
- Connection.....I/P: 3 poles, O/P: 4 poles screw DIN terminal

Installation

The Contractor shall install the CCTV assemblies at those locations as shown in the Project Plans.

The Contractor shall install and fully adjust the camera with the associated lens, power supplies, housings, and pan/tilt and dome units (if applicable), and furnish and install all necessary cabling, etc., to make the assembly completely operational.

The Contractor shall firmly attach the camera to the housing. The Contractor shall exercise care to tighten the camera mount within the torque limits specified by the camera manufacturer.

The Contractor shall properly terminate all of the electrical cables to the camera and firmly attach them.

The Contractor shall adjust the camera mounting in the housing such that the lens is 0.24" from the heating element.

The Contractor shall set the camera Back Light Compensation (BLC) mode to BLC3 in the camera setting menu. Other features and modes shall remain at the manufacturer's default settings.

The Contractor shall adjust the back-focus adjustment on the camera such that the lens focus is properly set. The Contractor shall make this adjustment with the lens iris at full open position.

Testing

All equipment shall be tested at the camera locations during both daytime and nighttime to verify proper operations and ensure picture quality. The testing shall be conducted in conformance with these Specifications. Videotape each camera for 60 seconds both day and night for future reference.

The Contractor shall arrange to have a signal technician qualified to work on the CCTV Camera System and employed by the CCTV Camera System manufacturer or his representative, present at time the equipment is turned on.

The video images shall meet the requirements of the National Television Standards Committee (NTSC) standard of one volt peak-to-peak, 75 Ohms signaling and the Electronic Industries Association (EIA) standard EIA RS_250C.

The Contractor shall successfully complete the Camera Cable Test and Local Operations Test as described below.

Local Field Operations Test

The Contractor shall perform the Local Field Operations Test at the CCTV field site, as follows. After all camera hardware, power supply, and connecting cabling has been installed, demonstrate the following:

1. Verify physical construction has been completed in accordance with the Contract Documents and specifications.
2. Inspect quality and tightness of ground and surge protector connections.
3. Check power supply voltages and output.
4. Connect devices to power source.
5. Verify the installation of specified cables and connections between camera, pan/tilt unit, camera control receiver, and video/data transmission equipment.
6. Set the camera control address.
7. Verify presence and quality of video image with a waveform monitor and a portable NTSC monitor.
8. Test local operation of all CCTV equipment, by exercising the pan, tilt, zoom, focus, iris opening, and manual iris control selection and operation, low pressure alarm (if present), pre-set positioning, and power on/off functions while observing the video picture on a portable video and waveform monitor. The City will provide the control keypad to the Contractor for testing of the PTZ units. The Contractor will configure the keyboard to send PTZ commands directly to the camera. The Contractor will also furnish all other test equipment.
9. Demonstration of camera sensitivity at low light levels to meet the specified requirements.
10. Demonstration of pan/tilt speed and extent of movement to meet the specified requirements.
11. Measurements of video signal level at the communications interface with a waveform monitor to verify NTSC Standards.
12. Verify proper voltage of power supply.
13. Submit copies of the test results, including any unsuccessful and subsequently successful tests to the Project Engineer prior to any field operations testing.

Warranty

The entire CCTV camera assembly shall be warranted to be free from defects from workmanship and material for one (1) year from the date of shipment by the manufacturer. Any parts found to be defective within the warranty period shall be replaced by the contractor at no expense to the City.

Traffic Interconnect Network Element Specifications

System Architecture – Overview

The traffic interconnect network element (network element) is required to operate on existing copper pair facilities that are part of the traffic interconnect communications network. The network element will support G.SHDSL.bis line encoding and decoding with signal processing capabilities to extend the rate and reach of the transmitted signals in the presence of external interference. Line rates per pair must be able to operate at a rate of up to 15+ Mb/s symmetrical with the ability to bond multiple pairs for a total bandwidth of 60+ Mb/s. The bonding protocol of the Network element must comply with the EFM/G.bond standards.

The network element will have the capability to bond copper pairs operating in an east and west direction supporting linear add drop networking. The network element must have the ability to continue operating over a single copper pair even if all other pairs have been damaged. In addition the system must be able to return to normal working status and highest available bandwidth once the damaged copper pairs are restored without intervention from a field technician.

All operating parameters described above must be contained in a one RU high housing and capable of supporting two network elements with all of the functionality included in this document in one Rack unit.

The Network Element must have the capability of being either AC or DC powered for flexibility in installation applications.

Enhanced Signal Processing and System Resiliency

Signal processing will include at a minimum coordinated line management to enable maximum rate and reach performance of each copper pair working together in a bond copper pair configuration. In the event of an individual copper pair failure the system will remain in operation with a minimal impact on the existing working pairs.

Integrated Ethernet Switching Capabilities

Each network element will include an integrated managed Ethernet switch capable of providing multiple 10/100 ports to communicate with various devices within a traffic controller cabinet and one port for local management. The integrated Ethernet Switch will also offer the following Local Area Network capabilities:

- Dynamic Bridging IEEE 802.1, 8K MAC address
- VLAN Tagging IEEE 802.1Q
- Double Tagging Q-in-Q, VMAN
- MSTP, RSTP, STP IEEE 802.1d
- OAM/CFM IEEE 802.3ah, 802.1ag

Quality of Service

- Classes of Service 4
- Scheduler WFQ, SP
- Classification L2 802.1p/Q priorities
L3 ToS/DiffServ

Integrated Optics

Each network element will have the option to support an additional optical interface operating up to a 100Mbps or 100/1000 Mbps line rate. The optical port upgrade option will be available via a SFP optical plug in module and be capable of working in conjunction with both high speed links (East and West). In addition, should the network be upgraded to fiber backhaul, the system must be able to support the fiber connection while continuing to provide existing Ethernet services over existing hardware, thus allowing for a fiber upgrade without replacing the existing hardware.

Network Management

In order to support ease of operation and the lowest possible on-going operating expense the network elements will need to be support by both a craft Graphical user Interface and an Element Management System that can be located at the Traffic Operations center or any other appropriate location.

Management Protocols

- | | |
|--------------------------|-----------------|
| • SNMP | SNMP v1 and v2c |
| • Command Line Interface | TL1 |
| • Remote Access | Telnet |
| • Secure Access (option) | SSH v2 |
| • Time Synchronization | SNTP v3 |
| • Web Access | HTTP |
| • File transfer | FTP, TFTP |

Front Panel Indicators (LEDs)

- Power
- Status
- Alarm
- MLP per modem/pair
- ACT (Activity) per Ethernet port
- LNK (Link) per Ethernet/HSL port

Safety

- UL 60950, CSA C22.2 60950
- ETSI EN 60950, IEC 60950

EMC

- FCC Part 15 Class B
- ICES-003 Class B
- ETSI EN 300 386 Class B
- ETSI ETS 300 132-2

NEBS

- Level III (GR-1089-CORE, GR-63-CORE)

NEMA

- Rated -34 C to +74 C

The traffic interconnect network elements shall be contractor furnished and shall be installed at locations as shown on as shown on the project plans. The model shall be Actelis brand ML130, ML624, ML638, and ML688 or approved equal per project plans.

Signs

General

Existing signs on traffic signal poles or mast arms shall be removed or covered when they become obsolete or convey a message that misguides or misdirects traffic as directed by the Engineer.

Traffic Signs on Signal Mast Arms

Traffic signs on signal mast arms shall be furnished and installed by the contractor. Installation shall be per Section 56 Signs of the Standard Specifications. Signs shall be 0.125" thick and have a minimum size of 36"x36" and a maximum size of 48"x48" or as shown on the project plans. All sign sizes are subject to approval by the Engineer. Sheeting shall be of Diamond Grade – DG3 with vip legend.

Street Name Signs (SNS) on Signal Poles

SNS shall only be installed on the shaft of the mast arm signal pole. SNS shall be furnished and installed by the contractor. As shown on the plans. Materials and installation shall be per Option 1 of the City of Concord detail S-32.

Payment

Traffic signs and reflectorized street name signs installed on traffic signal poles shall be included in the lump sum cost of the traffic signal and no additional compensation shall be allowed therefore.

Quality Assurance

The Contractor will be given one "punch list" for the contract to be completed within 30 calendar days. This will include a "compliance recheck" of the punch list. If the compliance recheck is performed, and it is found that the Contractor has not completed the punch list, the contractor shall receive an additional 15 calendar days to complete the list. The cost of subsequent compliance rechecks will be deducted from any monies due, or which may become due the Contractor.

Technical Assistance & Back-Up Services

The manufacturer's representative shall provide the City with a California telephone number for the ordering of replacement parts that are required and for providing technical advice to City personnel.

The manufacturer shall have on hand at this number a complete file of the City's equipment, including all serial numbers pertinent to this project.

The manufacturer shall have available at the telephone number a person with competence in parts, nomenclature and functional characteristics of the City's signal controller equipment. This person shall be able to provide descriptions, part numbers, prices and availability of the City's requirements. A fully qualified electronics technician with the capacity to expertly advise on all matters relating to the City's equipment shall be available immediately, or by return telephone call within 24 hours (normal work days only, holidays and weekends accepted).

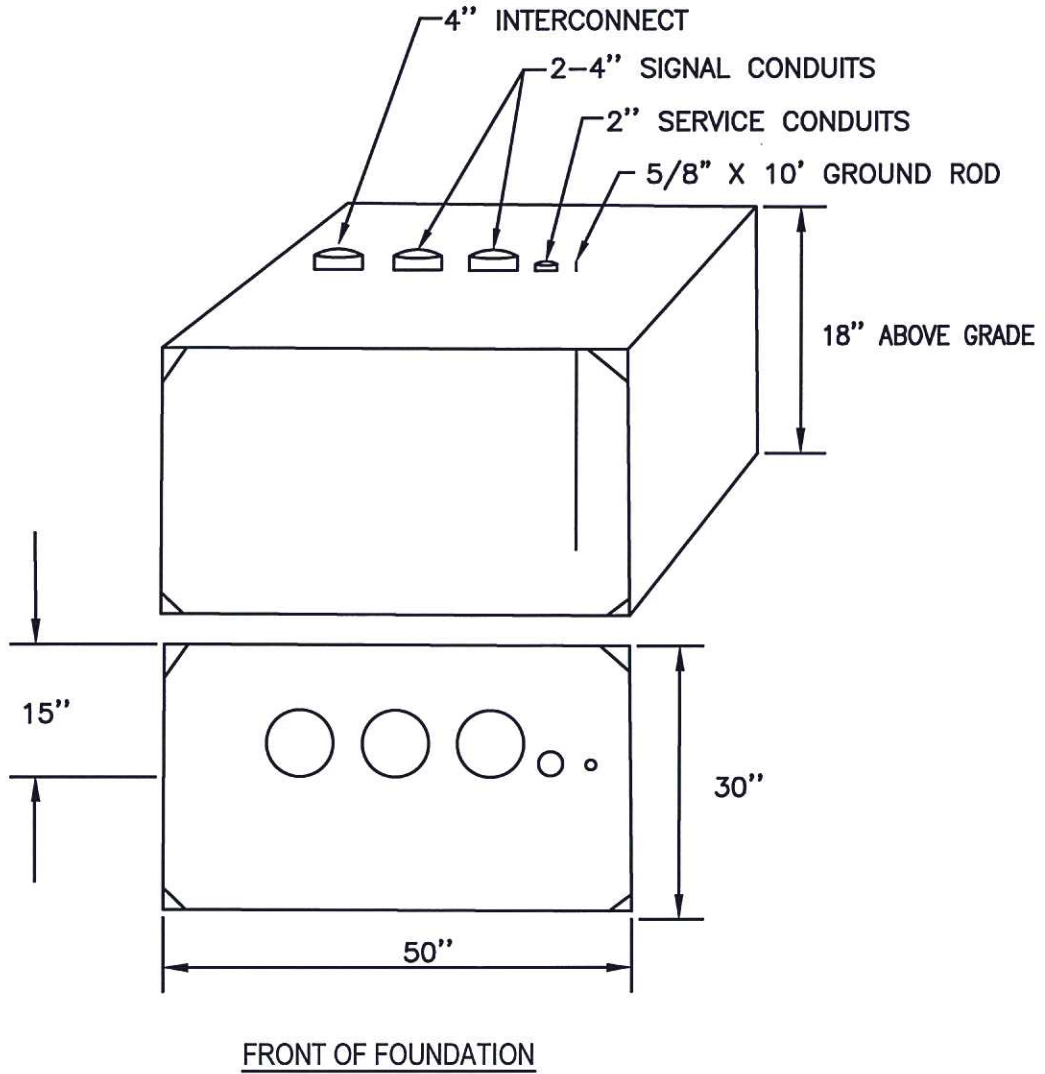
There shall be no charge to the City for any advice or information provided in this matter.

Workmanship

All facilities shall be installed in a professional and workmanlike manner. Any portion of the signal system, which is not installed in a professional manner, shall be removed and reinstalled correctly to the satisfaction of the Engineer.

Payment

The contract lump sum price paid for installation of "New Traffic Signal" or modifications of "Existing Traffic Signal" shall include full compensation for furnishing all labor, materials including hardware, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing, modifying, or removing the signals, lighting and electrical systems, combinations or units thereof, including but not limited to foundations, poles, mast arms, conduit, cable, pull boxes, signal heads, signal indications, actelis, pedestrian signal system, inductive loop detectors, emergency pre-emption system, cabinet, controller, service, battery back-up system, luminaires, PTZ camera, Ethernet, video detection camera, trenching, boring, restoring curb, sidewalk, landscaping, pavement, pavement markings and stripes, and appurtenances damaged or destroyed during construction, and salvaging existing materials as shown and specified on the project plans, as specified in these Special Provisions and as directed by the Engineer, and no additional compensation will be allowed therefore.



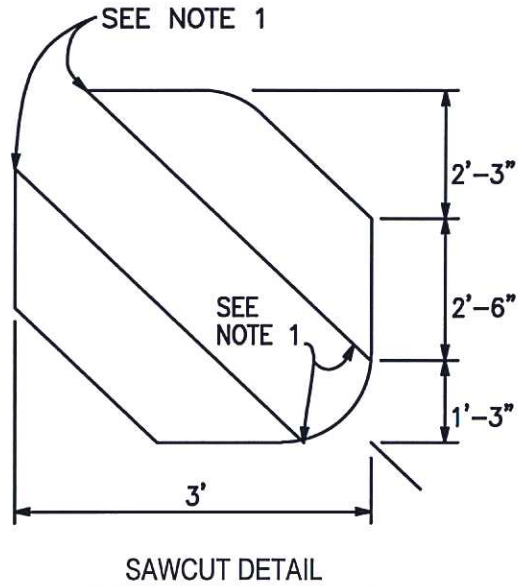
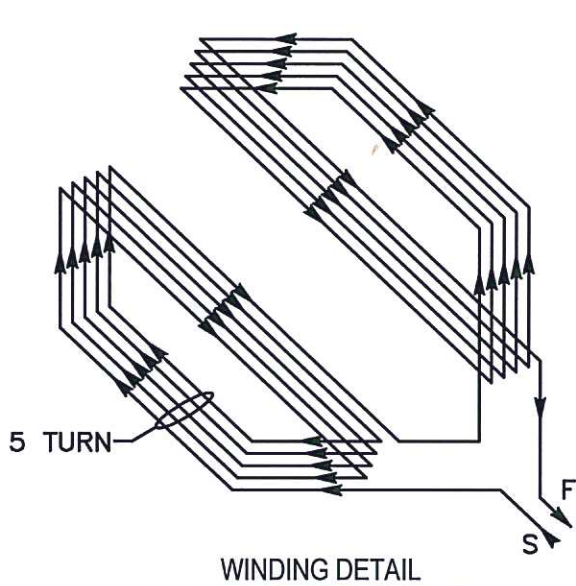
NOTES:

1. DEPTH OF OF FOUNDATION SHALL BE 18" MINIMUM.
2. FOUNDATION SHALL HAVE 3/4" CHAMFER STRIP ON ALL EDGES.



CITY OF CONCORD

TYPE "P" CABINET
 FOUNDATION DETAIL



MODIFIED TYPE "D" LOOP DETECTOR CONFIGURATION FOR BIKE LOOP

NTS

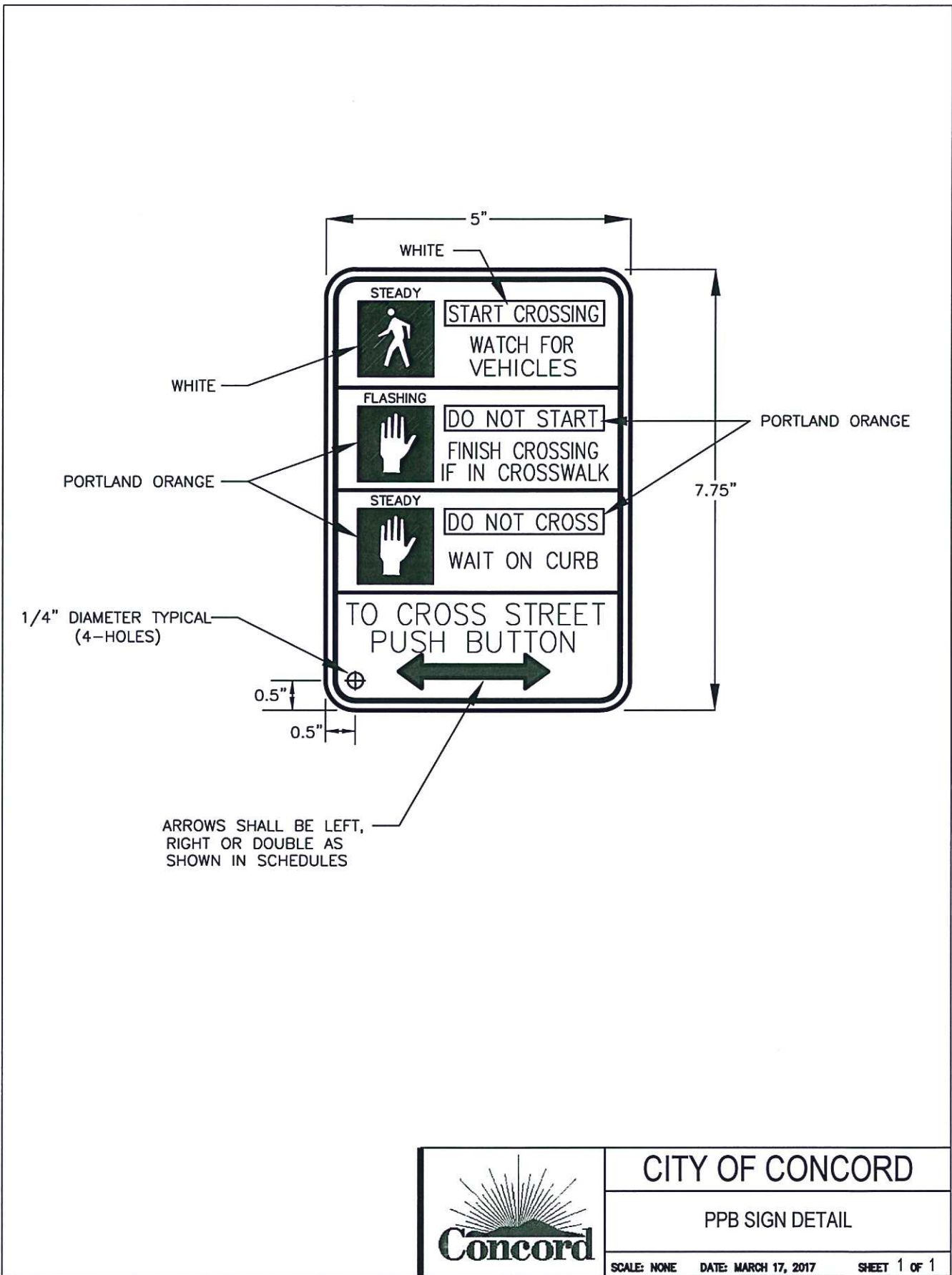
NOTES:

1. ROUND CORNERS OF ACUTE ANGLE SAWCUTS TO PREVENT DAMAGE TO CONDUCTORS.



CITY OF CONCORD

MODIFIED TYPE "D"
LOOP DETECTOR CONFIGURATION



CITY OF CONCORD

PPB SIGN DETAIL

RODENT SCREEN

WIRE MESH FOR PULL BOXES

