

CITY OF ANTIOCH

SPECIAL PROVISIONS

Insert Intersection Here
TRAFFIC SIGNAL

Consultants must track changes prior to any document modifications. The changes must be approved by

agency staff at the 100% stage. The user must delete or add content pertinent to the project, including applicable standard plans.

SECTION D-1. SIGNAL CONSTRUCTION DETAILS

D-1.01 REMOVE TRAFFIC PAVEMENT MARKINGS AND PAVEMENT MARKERS. Removal of traffic stripes, pavement markings and pavement markers shall conform to the provisions in Section 15, "Existing Highway Facilities," of the State Standard Specifications and these Special Provisions.

Traffic stripes and pavement markings, when no longer needed for traffic lane delineation, shall be removed by the grinding method on standard concrete or asphalt pavements as shown on the plan and as designated by the Engineer. Other methods such as water blast as required by the engineer when pavement surface is stamped concrete/asphalt or decorative in nature. City or state regulation shall be required for water treatment. Existing pavement markers, when no longer required for traffic lane delineation, shall be removed as shown on the plan and disposed of as directed by the Engineer. Payment is included in the lump sum price for traffic striping.

Nothing in these Special Provisions shall relieve the Contractor from his responsibilities as provided in Section 7-1.09, "Public Safety," of the State Standard Specifications.

SECTION D-2. (APPLICABLE CALTRANS STANDARD PLANS – May 2006)

A-10A	A-10B	ES-1A	ES-1B	ES-1C	ES-2D
ES-3C	ES-4A	ES-4B	ES-4C	ES-4D	ES-4E
ES-5A	ES-5B	ES-5C	ES-5D	ES-7A	ES-7B
ES-7E	ES-7G	ES-7M	ES-7M	ES-7O	ES-8
ES-11	ES-13A	ES-13B	Modify as needed		

SECTION D-3. SIGNALS, LIGHTING AND ELECTRICAL EQUIPMENT

D-3.01 DESCRIPTION. Work consists of furnishing and installing traffic signals, lighting and communication conduit **Insert additional descriptions here** at the intersection of **(Insert Intersection Here)**. Work shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the State Standard Specifications, dated 2006, State Standard Plans, dated 2006, and these Special Provisions.

D-3.02 EQUIPMENT LIST AND DRAWINGS. The controller cabinet schematic wiring diagram and intersection sketch shall be combined into one drawing and installed on the cabinet door, so that when the cabinet door is fully open, the drawing is oriented with the intersection.

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

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

The maintenance manual and operation manual may be combined into one manual. The maintenance manual or combined maintenance and operation manual shall be submitted at the time the controllers are delivered for testing or, if directed by the Engineer, previous to purchase. The maintenance manual shall include, but need not be limited to, the following items:

- a. Specifications
- b. Design Characteristics
- c. General operation theory
- d. Function of all controls
- e. Trouble shooting procedure (diagnostic routine)
- f. Block circuit diagram
- g. Geographical layout of components
- h. Schematic diagrams
- i. List of replaceable component parts with stock numbers

The Contractor is required to furnish the manuals to the City's Traffic Engineer and to Contra Costa County Signal maintenance staff.

D-3.03 ORDER OF WORK. The first order of work shall be for the contractor to contact USA (Underground Service Alert) to have the location of all utilities marked prior to ordering of pole standards. Contractor shall then be responsible for locating and marking the positions of all signal standards and pull boxes. The Engineer may assist the Contractor in locating the above items. The contractor shall coordinate the layout with the utility company representatives to avoid utility conflicts.

If conflicts with existing utilities are indicated, the contractor shall "pot hole" to find the exact location of the utilities at the location of the conflicting signal standard.

The Engineer shall approve the locations before any work on the foundations is performed. All final locations of poles shall be determined BEFORE any poles (standards) are or equipment is ordered by the contractor.

Full compensation for locating and marking the positions of the signal standards and pull boxes, shall be considered as included in the contract lump sum price paid for "Signals and Lighting," and no additional compensation will be allowed therefor.

D-3.04 FOUNDATIONS. Foundations shall conform to the requirements of Section 86-2 "Foundations" of the State specifications except as modified herein.

The controller and service bases shall be located as shown on the plans behind the back of the existing sidewalk area. The controller base, service base, and necessary pull boxes shall be located prior to installing the new controller pad. Pull boxes shall be adjusted to match the finished grade of the new controller pad.

The first sentence of the eighth paragraph in Section 86-2.03, "Foundations," of the State Standard Specifications is amended to read:

Anchor bars or studs and nuts, except for Type 30 and Type 31 lighting standards, shall conform to ASTM Designation: A 307. Headed anchor bolts for foundations shall conform to the specifications of ASTM Designation: A 307, Grade B with S1 supplementary requirements. At the option of the Contractor, non-headed anchor bolts for foundations shall conform either to the specifications of ASTM Designation: A 307, Grade C or to the provisions in AASHTO Designation: M 314, Grade 36 or 55 with S1 supplementary requirements. If non-headed anchor bolts conforming to the specifications of ASTM Designation: A 307, Grade C are furnished, the end of each fabricated anchor bolt shall be either coded by end stamping as required in ASTM Designation: A 307 or the end that projects from the concrete shall be permanently coded with a green color by the manufacturer.

D-3.05 STANDARDS. STEEL PEDESTALS AND POSTS. Only a side tenon at the end of the signal mast arm will be acceptable.

The sign mounting hardware, as shown on Detail U of Standard Plan ES-7N, shall be installed at the locations shown on the plans.

All signal standards shall have a minimum of 2 inches and a maximum of 4 inches of grout installed between the bottom of the base plate and the finished grade.

D-3.06 CONDUIT. Conduit to be installed underground shall be the rigid non-metallic type, Schedule 40. All conduits shall enter a pull box with a "sweep" 90-degree elbow unless permitted otherwise by the Engineer. All existing and new conduits shall have a 3/8-inch, traceable, pull rope installed.

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

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

When a standard coupling cannot be used for coupling metal type conduit, a UL listed threaded union coupling, as specified in the third paragraph in Section 8~2.05C, "Installation, of the State

Standard Specifications, or a concrete-tight split coupling or concrete-tight setscrew coupling shall be used.

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

At locations where conduit is installed under pavement and existing underground facilities are present, special precautions are required as described in "Obstructions" of these Special Provisions.

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

New conduit installations shall not be trenched in existing roadways. For conduit installations crossing paved roadways, only the jacking or boring method shall be used. Conduit shall have no less than 3.5 feet cover for clearance of future road widening.

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

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

In areas where additional pavement is to be placed, trenching installation shall be completed prior to placing final pavement layer.

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

The conduit shall be placed in the bottom of the trench and the trench shall be backfilled with sand to a minimum of 3 inches of cover over the top of the pipe. The remainder of the trench shall be backfilled to

the bottom of the pavement layer with 3/4-inch Class 2 aggregate base that meets the requirements of Section 26 of the State Standard Specifications. The remainder of the trench shall be paved with 1/2-inch Type B asphalt concrete to match existing asphalt grades, unless otherwise specifically shown on the plans. Asphalt section shall be a minimum of 4-inches thick.

Prior to spreading asphalt concrete, paint binder shall be applied as specified in Section 394.02, "Prime Coat and Paint Binder," of the State Standard Specifications. Spreading and compacting of asphalt concrete shall be performed by any method that will produce an asphalt concrete surfacing of uniform smoothness, texture, and density. A vibrating steel wheel roller is the suggested method to provide a long lasting asphalt trench pavement.

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

All trenches shall be paved within 24 hours of the installation of the aggregate base backfill. If the Contractor does not comply with this section, the Engineer shall order the work done by others and deduct double the cost of doing the work from payment due the Contractor.

D-3.07 PULL BOXES - All existing pull boxes and/or pull box lids, which are cracked or broken, shall be replaced with new. All new pull boxes shall be reinforced concrete with reinforced concrete lids and shall be labeled "TRAFFIC SIGNAL".

Grout shall not be placed in the bottom of pull boxes. Pull box sumps shall be constructed from 1-1/2" minimum clean/washed river rock and shall be a minimum of 12 inches deep.

Recesses for suspension of ballasts will not be required.

All 24"x42" pull boxes shall be furnished with reinforced concrete, split lids, and shall be labeled "TRAFFIC SIGNAL".

All pull boxes shall be labeled "TRAFFIC SIGNAL" except that the pull box at the P.G.& E. service point shall be labeled "ELECTRIC" or "P.G.& E" and the pull box for the interconnect cable shall be labeled "INTERCONNECT".

In landscaped, dirt, and gravel areas, pull boxes shall be installed with 12" wide x 4" deep concrete collar around new pull boxes.

D-3.08 CONDUCTORS AND WIRING - At least 6 feet of slack shall be provided in the pull box nearest each signal standard, for those conductors running to that standard; and 3 feet of slack shall be provided in each conductor in all other pull boxes. The wire bundle entering the controller cabinet shall be coiled in the bottom of the cabinet in order to obtain as much slack as possible.

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

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

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

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

Each detector loop wire shall extend to the pull box. Splices shall be made in the pull box, not in the detector hand hole.

Signal Interconnect Cable - Signal Interconnect Cable (SIC) shall consist of 25 pair #22 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.

D-3.09 BONDING AND GROUNDING - Anchor bolts for Type 1-B standards shall be bonded together and to the metallic conduit or to the bonding conductor in a non-metallic conduit. Type 3/16 inch or larger bolt will not be required for the Type 1-B standards. Bonding shall be inspected and approved by the Inspector or Engineer prior to placing foundation concrete.

D-3.10 FUNCTIONAL TESTING - Controllers, auxiliary equipment, and cabinets shall be delivered F.O.B. to the Contra Costa County Signal Maintenance Shop, 2467 Waterbird Way, Martinez, CA, for operational testing. Deliveries shall be made on Monday through Thursday between 8:00 AM and 5:00 PM.

All shipping cartons and cabinets shall be externally labeled with the site location.

The manufacturer of the controller system, specified in Section D-3.13, "Model 170E Controller Assembly," of these Special Provisions, shall certify to the Agency that the "system" has been thoroughly bench and operationally tested, and that as a controller system, all components are operating in conformance with these Special Provisions.

If any of the equipment is rejected for failure to comply with the requirements of these Specifications, the Contractor shall be responsible for all of the costs involved in re-testing the equipment after it has been rejected. Deductions to cover the cost of such re-testing will be made from any payments due or which may become due the Contractor.

Within 14 calendar days of receipt of Contractor's Materials List, the City shall have the right to request a sample of any materials used for the construction of the traffic signal; including, but not limited to, controller & controller cabinet, signal heads, poles, conductor wire and any other item deemed necessary to be tested or inspected for compliance with the specifications. Contractor shall deliver those materials requested within 21 calendar days of request. If the City does not receive the requested materials within the time specified, those materials requested shall be deemed to be unsatisfactory, and rejected.

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

The Contractor will be given one "punch list" for the contract. This will include a "compliance recheck" of the punch list. If, when the compliance recheck is performed, it is found that the Contractor has not completed the punch list, the cost of subsequent compliance rechecks will be deducted from any payment due or which may become due the Contractor.

If any of the equipment is rejected for failure to comply with the requirements of these Specifications, the Contractor shall be responsible for all the costs involved in re-testing the equipment after it has been rejected. Deductions to cover the cost of such re-testing will be made from any payment due or which may become due the Contractor.

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

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

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

D-3.11 SERVICE - The Contractor shall furnish and install the Service Equipment Cabinet and BBS as shown on the signal plans and as provided in the Standard Specifications, and these Special Provisions. It shall be located at least 6 feet from the controller assembly with the meter facing the roadway. The service equipment shall be a TESCO TRAFFIC 27-000/22 BBS 1400XL-6 (CITY OF ANTIOCH SPEC) unless otherwise authorized.

SERVICE ENCLOSURE:

- Service enclosure shall be 20" Wide X 50" High X 10 ¼" Deep.
- Service enclosure shall meet EUSERC requirements.
- Service enclosure shall include Type V PEU.
- Service enclosure shall be fabricated from ⅛" aluminum.
- Interior of service enclosure shall be fabricated from 14 gauge cold rolled steel & painted white.
- Service enclosure shall be painted Mint Green or a City approved color.
- Service enclosure shall have continuous welded seams.
- Service enclosure shall have full length dead front with stainless steel hinge.
- Service enclosure shall be a UL 508 industrial control panel label for service entrance equipment.
- Service enclosure shall have pull section with removable step.
- Service enclosure shall have a fully framed side hinged outer door with swaged close tolerance sides for flush fit with top drip lip and closed cell neoprene flange compressed gaskets.
- Service enclosure shall have hinged dead front with ¼ turn latch & knurled knobs.
- Service enclosure shall have a core mortise lock with keys provided
- Dead front door shall be hinged on the same side as exterior door & open a minimum of 100°.
- Removable back panel 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 and 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 enclosed in clear plastic & held inside the outer door by welded hooks.
- 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.

BATTERY BACKUP SYSTEM:

Anodized aluminum weatherproof enclosure 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, pad-lockable draw latch (center area on door-latch side), and two pad lockable welded-in place vandal-proof tabs (one upper area, one lower area on door-latch side, rated at 2000 lbs. each). 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 250 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 trays 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.

BBS PANEL MINIMUM FEATURES:

- System shall provide 700 watts of full control run time for two (2) hours. In addition the system shall provide six (6) to eight (8) hours of flash.
- BBS bypass and BBS isolation switch.
- Deadfront safety panel board with all switches, indicating fuses, plugs, and isolation fuses for each battery pre-wired with phenolic nameplates.
- All nameplates shall be screwed on 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 buckets.
- 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 1400 Volt-Amp continuous capacity. BBS must provide for utility service isolation when in operation. The minimum rating for wattage output will be 950 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 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 95% capacity within 6 hours. BBS will provide on-line operation for a minimum input of 92 to 145 VAC, provide full load output of 120VAC – 10% / +4% at 60 Hz +/- 0.05% over a temperature range of -37° C (optional adder) to +74° C and be a UL Approved Design.

For Safety and maintenance the BBS shall not exceed 28 pounds. The BBS unit will be delivered with maintenance manuals and schematic diagrams.

BBS UNIT MINIMUM FEATURES:

- 1400VA 950 Watts, with quick make/break connectors and plugs. (Systems requiring hard wiring termination to/from the inverter are unacceptable).
- Surge energy withstand 480 Joules, 6.5kA
- Common mode clamping 0 ns < 5ns typical UL 1449
- Conditioned power – Computer quality
- Transient lighting protection – 160 Joules
- Transfer to battery time – 2 ms
- Retransfer to utility – 2 ms
- Each battery shall be 24 volts @ 18 AH with heavy duty Anderson plugs and isolated fused (deadfront panel mounted 30 amp) 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.
- BBS 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), such as APC Smart-UPS RMXL or approved equal. 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.

ENCLOSURE TEMPERATURE COMPENSATION:

Operating temperature shall be a minimum -37° C to +74° C.

POWER SYSTEM ANALYZER AND CONFLICT RESOLUTION MODULE:

The 1400XL incorporates an integrated Power System Analyzer and Conflict Resolution Module. 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 the normal operation.

TRIPLE BYPASS SYSTEM FOR OFFLINE BBS:

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

SMART BATTERY CHARGER:

Shall charge from shut off discharge to 95% fully charged in less than 6 hours. Batteries shall be ambient enclosure compensated to less than 120°. The battery charger shall utilize Smart Cell Technology to extend battery life.

INTELLIGENT BATTERY MANAGEMENT:

The intelligent battery management system shall regulate under and over voltages without switching to battery and shall automatically performs a self-test every two weeks. Through software, or the push of a button, self-tests may be performed at anytime. Battery charging systems shall be microprocessor controlled to precisely charge batteries in less time than in legacy BBS systems.

HOT-SWAPPABLE BATTERY REPLACEMENT:

A user friendly, hot-swappable battery replacement system shall be used. The BBS shall not be required to be sent to the factory for battery service. Replacement of batteries shall be allowed while the system is up and running. Replacement battery packs shall be shipped in a reusable box for convenient return of exhausted batteries to a recycling center.

WARRANTY:

Manufacturer 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.

D-3.12 PAINTING - Painting shall conform to the provisions in State Standard Specification Section

86-2.16, "Painting," and these Special Provisions.

Signal standards shall not be painted.

Guard posts (bollards) shall be painted white.

The controller cabinet and service cabinet shall be factory coat mint green.

D-3.13 MODEL 170E CONTROLLER ASSEMBLY - Model 170E Controller Assembly components shall conform to the State of California Business and Transportation Agency, Department of Transportation Specifications for Traffic Signal Control Equipment dated January 1989, and all current addenda. It shall also meet the requirements of AB3418 and be NTCIP compliant.

Contractor shall provide for the following:

1. All convenience receptacles shall be Ground Fault Interrupter (GFI) type.
2. All labeling shall be either silk screen or phenolic/engraved.
3. All circuit breakers shall have the rating engraved into the handle.
4. EPROM socket U3 of the 412C shall be of the "0" insertion force type, i.e. the EPROM chips shall be installed or removed without the use of tools.
5. Provide a test switch panel in the cabinet, installed above the controller unit, for Phases 1 through 8, PPB's, EVA, EVB, EVC, EVD, RR1 and RR2. Switches shall be on-off-momentary contact types.
6. Provide dual ACIA's on all Model 170 Controllers, for two- way communications.
7. Dual ACIA's shall be integral to the controller unit.
8. Provide an 18" fluorescent light in the cabinet.
9. All Model 170 Controller boards shall be of the "vertical mount" type, horizontal mount boards are NOT ACCEPTABLE.
10. The PDA and the Cabinet Power Supply shall be combined into one unit. Unit shall be currently approved by CALTRANS.
11. Controller cabinet shall be provided with dual exhaust fans.
12. Provide full width slide out shelf

COMPONENTS OF THE MODEL 170E CONTROLLER ASSEMBLY

The Contractor shall furnish all signal control equipment necessary to accomplish all functions at this intersection as shown on the plans. The Type 170E controller shall come equipped with an internal 400 modem as well as the most current Bi-Trans 233 operating software.

An additional set of controller shelves shall be installed in the cabinet, for a future submaster controller, or writing surface. Shelf shall be full width in the rack.

The Model 170E Controller and controller cabinet shall be manufactured and furnished by the same manufacturer, and shall form a complete functional controller system capable of providing the traffic signal operation specified. All "Local" and "Submaster" programs shall function as specified in the Contra Costa County's "Central Master System Software Description", a copy of which can be obtained from the County's Traffic Division, 255 Glacier Drive, Martinez, 94553. Controller shall be provided with a restart switch installed on the inside of the controller unit (not on front panel). All traffic control equipment to be furnished shall be currently acceptable to the CALTRANS Laboratory, Sacramento, CA, and shall be currently listed on the Department of Transportation "QPL" lists.

A digital I/O Wraparound Connector for C1, and a Communications Wraparound Connector for C2 shall be furnished for each controller. Diagnostics shall be furnished for each System Memory Module. The system memory modules shall provide for 32K EPROM, 4K RAM, and by switch selection using 2764, 27128, or

27256 EPROMS and shall be battery backed up using a 30 day lithium battery. EPROM's for use in the System Memory Modules shall have a maximum rating of 250 ns. All load switches shall be of the "crydom" type.

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

CONTROLLER CABINET

Attention is directed to the provisions in Section 86.2.11, "Model 170 Controller Assembly," and these Special Provisions. Field wiring terminal strips shall be capable of accepting up to four (4) conductors for each phase. The controller cabinet shall be furnished with the "detector input side panel harness" option.

A twelve position terminal strip shall be provided for the terminations of interconnect wiring and voice communication lines. Two wall mount touch-tone phones shall also be installed on the side panel of the rack, above the communications terminal block, and shall use a Bi-Trans, Inc. Model Number CCC1 Telephone Interface, or approved equal. The telephone interface shall be furnished by the firm producing the software and installed by the firm producing the cabinet. Two C2 and a C20 connector with 6 FT cables shall be wired to the twelve position interconnect terminal strip in the cabinet to provide for interconnect to the local, and a submaster if specified, or back to the Central Master.

The phones shall be connected to a AT&T line, with the AT&T service to be determined at this time, and field-tested prior to acceptance by the City.

The Model 332 Controller Cabinet shall be constructed from **stainless steel and shall have rollout shelves**. The cabinet delivered to the County for testing shall be painted "CALTRANS Mint Green" in accordance / with current CALTRANS standards.

D-3.14 VEHICLE SIGNAL FACES AND SIGNAL HEADS - Terminal compartments, MAS and MAT mounts, slip fitters and curved washers shall be bronze. Signal indications shall be furnished and installed by the Contractor.

"KO" 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 a "beauty plug" designed for such purpose.

All traffic signal heads, louvered backplates, visors and frameworks shall be "factory powder coat" painted in lieu of conventional painting. All signal heads shall be factory assembled with their respective frameworks and tagged by location and intersection. Signal heads and frameworks, as a unit, shall be installed by the Contractor's workmen at the job site. Extreme care shall be taken by the Contractor's workers during the installation of the signals, frameworks and heads. Any scar marks, or cosmetic damage to the equipment caused from tools or installation processes shall be cause for rejection.

The factory powder coat finish shall be applied as described below:

1. Pretreatment Process
 - a. Acid etch degreasing bath
 - b. Clean water rinse
 - c. Iron phosphate adhesion bath
 - d. Clean water rinse
 - e. Non-chromate acidulated seal bath

2. Thermal set process

- a. Convey parts through drying oven for 10 minutes at 300°F to 400°F.
- b. Apply polyester or epoxy-based dry powder coating at 75-90 kV.
- c. Convey parts through curing oven for thermal setting for 20 minutes at 400°F.

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 vehicle signal indications shall be 12-inch, light emitting diodes (LED's) and **ALL** pedestrian signals shall be LED's. All signal head housings shall be the metallic type. The LEDs shall have the incandescent look either Dialight or Gelcore GT, arrow or circular.

The LED signal modules shall have prominent and permanent directional marking(s) that have an "UP arrow" for correct indexing and orientation within a signal housing.

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

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

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

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

At time of installation, the legs of LED's (heat dissipaters) should be kept at a full length to improve heat dissipation from LED's.

The replacement of one or more LED's as well as the replacement of one or more LED circuits must be possible without desoldering or soldering.

The modules shall consist of an assembly comprising an internal beam controlling optical faceted lens with a maximum of 300 LED's for 12-inch ball indications and 100 LED's for 12-inch arrow indications.

The minimum luminous intensity values and light output distribution shall be as shown in Section 11.04 and Table 1 of the VTCSH standard.

Each LED signal module shall be tested for light output at 90 to 120 volts. LED signal modules shall not be allowed to fall short of the minimum intensity values at any of the 44 measuring points of the standard when lamp is turned on cold for measurement and after a 30 minute warm-up period at 100% duty cycle.

The chromaticity of LED signal modules shall conform to the chromaticity requirements of Section 8.04

and Figure 1 of the VTCSH standard.

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

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

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

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

Two captive, 2-color coded, 36 inch long, 600 V, 18 AWG minimum, jacketed wires, conforming to the National Electric Code, rated for service at 105°C, are to be provided for electrical connection to each individual signal module.

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

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

The LED signal module will be replaced or repaired by the manufacturer if it exhibits a failure due to workmanship or material defects within the first 60 months of field operation. For security purposes, if any one LED circuit should fail, it should be easily identifiable by visual inspection and replaced or repaired as per above warranty.

LED signal indications shall be Gelcore series or Dialite Dura-Led 433 series or approved equal. LED "arrow" signal indications shall be Synchronex Model 1-LED-2030 series or Dialite Dura-Led 433 series or approved equal. Requests for use of an approved equal shall be submitted, in writing, to the City Engineer prior to ordering and shall have all technical specifications and catalog "cut sheets" attached as an appendix. A list of locations where the requested hardware has been previously installed must accompany the written request as an additional appendix. In addition, a sample of the hardware must be supplied to the City for inspection and approval.

All LED signal indications **SHALL NOT** have the "flash feature".

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

D-3.15 Countdown Pedestrian Signals-The contractor shall furnish and install Dialight, Gelcore, or approved equivalent prior to bid. Fully filled symbols and numerals are required. With countdown pedestrians signals, the modules shall include a 6" visor. The unit shall only countdown the flashing "Don't Walk" prior to clearance interval.

- LED countdown modules shall fit into existing 16" traffic signal housings built to VTCSH standards without modification to the housing.
- The LED countdown module shall be rated for use in the ambient operating temperature range of -40°C (-40°F) to +74°C (+165°F).
- The LED countdown module shall be completely sealed against dust and moisture intrusion per the requirements of NEMA Standard 250.

- The LED countdown module shall be a single, self-contained device, not requiring on-site assembly for installation into existing traffic signal housing. The assembly of the LED countdown module shall be designed to assure all internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.
- Three secured, color-coded (blue, red, white), 36 inches long, 600V, 16 AWG jacketed wires, rated for service at +105°C, are to be provided for electrical connections.
- The measured chromaticity co-ordinates for the "lunar white" walking man and the "Portland orange" hand and digits shall conform to the chromaticity requirements of section 8.04 and figure 1 of the VTCSH standard.
- The chromaticity measurements shall remain unchanged over the input line voltage range of 80 VAC to 135 VAC.
- The LED countdown signal module shall consist of a double overlay message combining the symbols of a hand and walking man and two 7-segment digits.
- The LED's shall be arranged in a manner to form an outline of the symbols. The shape of the outline shall conform to the standard symbols for pedestrian signals.
- The "Portland orange" LED's shall be of the latest AlIn GaP technology and the "lunar white" LED's of the latest In GaN technology.
- The driver board shall regulate the LED drive current on both hand/man messages to compensate for line voltage fluctuations over the range of 80VAC to 135 VAC. The luminous output shall not vary more than 10% over the voltage range and shall not be perceptible to the human eye.
- The drive circuitry shall include voltage surge protection to withstand high-repetition noise transients and low-repetition high-energy transients as stated in section 2.1.6, NEMA Standard TS-2, 1992.
- The circuitry shall ensure compatibility and proper triggering and operation of load switches and conflict monitors in signal controllers currently in use by the procuring traffic authority.
- The countdown module shall be compatible with all types of traffic controllers in existence.
- The countdown timer module shall have a microprocessor capable of setting its own time when connected to a traffic controller.
- The countdown timer module shall continuously monitor the traffic controller for any changes to the pedestrian phase time and re-program itself automatically if needed.
- The countdown module shall register the time for the walk and clearance intervals individually and shall begin counting down from the sum of both interval times.
- When the walk interval is pre-empted, the countdown module shall also pre-empt and skip directly to the clearance interval and countdown to reach 0 at the same time as the solid hand.
- In the cycle following a pre-emption call, when the module completes the walk interval countdown and the clearance interval has not yet started, the module shall display the clearance time and wait for the flashing hand to resume the countdown.
- The countdown module shall have an internal conflict monitor to prevent any possible conflicts between the hand/man signal indications and the time display. When the hand is solid, it shall be impossible to display any time on the display.
- When the countdown module is installed in a co-ordinated system and the walk interval time changes at every cycle, it shall be possible to blank out the walk time and only display the clearance time.
- The countdown module shall have dip-switches for the following user selectable options of display 0 during stand-by, turn on all LEDs for testing, "Co-ordinated" mode, displays clearance time only, disables dimming feature, disables 30 sec. Delay on dimming, and disables countdown display.
- The module shall have a spare input for special applications such as extending or reducing time on demand.
- LED signal modules shall be replaced or repaired if fails to function as intended due to workmanship or material defects within the first 60 months from date of delivery.

D-3.16 PEDESTRIAN PUSH BUTTONS - The second paragraph in Section 86-5.02, "Pedestrian Push Buttons," of the Standard Specifications is amended to read as follows:

"The housing shall be metallic. The assembly shall be weatherproof and shall be shockproof in any

weather condition."

The push buttons shall be ADA approved type (Dick Campbell Company) DCC-200 or approved equal.

D-3.17 DETECTORS - The Contractor verify that the existing loops are functional. If not new loops shall be re-cut to the same existing configuration shown on the plan. If re-cut the 6-foot diameter circular detector loops as shown on the plans and on standard plan ES-5B. The lead detector (closest to the limit line) shall be a round "Type D" loop configuration and all others shall be a "Type E" configuration. The loop detector wire shall be type 1, and the loop lead in from the field to the cabinet sensor unit shall be type B lead in cable. The drain wire in the detector cables shall be brought to the chassis ground by using a No. 14 (green) conductor wire and "PT" connectors.

The contractor shall test all existing loop detectors in the presence of the County signal maintenance technician and shall replace relevant, defective loop detectors. Contractor shall be paid for replacing defective loop detectors per replacement.

The third paragraph of Section 86-5.01A(5), "Installation Details," of the Standard Specifications is amended to read:

"Slots cut in the pavement shall be washed clean, blown out and thoroughly dried before installing conductors. Residue resulting from slot cutting operations shall not be permitted to flow across shoulders or lanes occupied by public traffic and shall be removed from the pavement surface before any such material flows off of the pavement surface. Residue from slot cutting operations shall be disposed of outside the highway right of way in accordance with Section 7-1.13."

Loop wire shall be spliced to the lead in cable in the pull boxes.

Conductors to be buried in the pavement shall be installed only in the presence of the City. Loops shall be installed in the new pavement prior to the final lift of A.C. paving being installed.

Sealant shall be 3M brand 5000 or approved equal to install the detector loops. Epoxy shall not be used except in concrete surfaces. Hot mix asphalt concrete ½" max. grading shall be used to fill all curb termination points.

Detector amplifiers shall be Reno A&E with LCD readout or equal.

D-3.18 SAFETY LIGHTING - All luminaires shall be of the cutoff type, Type III distribution, auto-regulating transformer, and without glare shields. Each luminaire shall be furnished without photoelectric unit receptacle. If the luminaire housing is provided with a hole for the receptacle, the hole shall be closed in a weatherproof manner by using one of the following methods:

1. A stainless steel or aluminum plate pressed into the larger hole of the boss and securely fastened with RTV silicone sealant.
2. A stainless steel or aluminum plate and gasket held by two stainless steel machine screws, which are fastened into a base nut plate.

The last sentence of the ninth paragraph in Section 86-6.01, "High Intensity Discharge Luminaires," of the Standard Specifications is amended to read as follows:

"The socket shall be rated for 1,500 watts and 600 volts, and shall be rated for a 4-kilovolt pulse."

The lighting circuit shall be 120 volts.

Wattage shall be as called for on the traffic signal "Conductor and Equipment Schedule" sheet(s).

D-3.19 BALLASTS - The twelfth paragraph in Section 86-6.10, "High Intensity Discharge Lamp BALLASTS," of the State Standard Specifications is amended to read as follows:

"Ballasts for luminaires to be mounted on mast arms shall be the regulator type and shall be located within the luminaire housing. The ballast for each horizontally mounted luminaire shall consist of components mounted on the luminaire housing, components mounted on a metal plate secured to the housing, or components mounted on a down opening door. The door shall be hinged and secured to the luminaire housing separately from the refractor or flat lens frame. The door shall be easily removable and replaceable. The door shall be secured to the housing in a manner to prevent its accidental opening when the refractor or flat lens frame is opened."

D-3.20 PHOTOELECTRIC CONTROLS - The service enclosure shall have an integral, Type V PEU and circuit to operate the two contactors and shall have a single test switch. The contactors shall be a mercury displacement type, installed in the Type III-AF service equipment enclosure. (See Section D-3.11 SERVICE of these Special Provisions.)

D-3.21 MAINTENANCE AGREEMENT - The traffic signal and safety lighting systems and equipment installed under these specifications, shall be covered by the Maintenance and Repair Agreement found in the Proposal and Contract Book. This agreement shall be executed by the Contractor prior to acceptance of the work as complete and shall be for a period not less than one (1) year from acceptance of the signal installation by the City Council.

D-3.22 WORKMANSHIP - All facilities shall be installed in a professional and workmanlike manner. Any portion of the signal system that is not installed in a professional manner shall be removed and reinstalled correctly, to the satisfaction of the Engineer.

D-3.23 EMERGENCY VEHICLE PREEMPTION - Emergency vehicle preemption hardware shall be "Opticom Traffic Control System", identical to and fully compatible with the existing fire preemption equipment in use in the local fire district or updated versions by the same manufacturer.

The Contractor shall install Preempt equipment as follows:

1. Opticom Detector Unit (ODU) - Model Number 711, 721 or 722 as shown on the plans
2. Opticom Model No. 752 Phase Selector
3. The Model 752 Phase Selector Harness shall be pre-installed in the controller cabinet
4. The detector cable shall be 3M (Opticom) Model No. 138 cable

Contractor shall furnish and install the Detector Units, and Cable as shown on the Plans.

D-3.24 LED INTERNALLY ILLUMINATED STREET NAME SIGNS. -- Internally illuminated street name signs shall be Light Emitting Diode (LED) Back Lit / Edge-Lit Internally Illuminated Street Name Signs.

1. Mechanical Specifications:

The outer dimensions of the sign assembly (excluding the mounting bosses) shall be a width of 18 inches, and standard lengths of 72 inches or 96 inches depending on the length of the street name.

All "IISNS" signs shall be double faced unless otherwise noted on the signal plans.

The maximum thickness of the sign shall be 1.38 inches for single sided signs, and 1.77 inches for double-sided signs.

The long edges of the sign shall be made from a single section of 6063-T5 Aluminum extrusion. The ends caps shall be affixed to the frame with stainless screws. The end caps shall be removable to enable replacing panels and components.

The overall weight, excluding mounting hardware, shall not exceed 6 pounds per square foot for single sided signs, and 8 pounds per square foot for double sided signs.

The sign shall have a polycarbonate panel that is UV, weather, abrasion and impact resistant. The front panel shall be replaceable.

The upper case letters shall be 6-inch and the lower case letters shall be 4.5-inch.

2. Environmental Specifications:

The sign shall be designed and constructed to withstand 178 Km/h (110 mph) wind loads in conformance with the requirements of the AASHTO publication, "Standard Specifications for Structural Supports of Highway Signs, Luminaries and Traffic Signals", 4th Edition 2001.

The sign and power supply should be able to withstand and operate at temperature extremes of -40 deg F to +140 deg F.

3. Luminance

Minimum luminance of the sign legend shall be 250 nits (Candela / Square Meter). Minimum luminance of the sign background shall be 25 nits (Candela / Square Meter). Sign elements to be illuminated shall include the sign legend and background, per MUTCD Section 2A.08.

4. Sign sheeting

Sign legend and background shall be retroreflective, ASTM type IX designation.

5. Light Source

The light source for the sign shall be LEDs (light emitting diodes) that are mounted along the top and bottom edges of the sign. The LEDs shall evenly illuminate a light panel that is the same dimensions of the sign face. The LEDs shall have a minimum projected life of 50,000 hours. A maximum of two LEDs per square foot shall be used for single sided signs, and four LEDs per square foot for double sided signs.

6. Electrical

The power supply shall housed inside the sign frame assembly. Power supply shall be UL Class 2 limited output voltage and current plus isolation for safe operation, and UL Outdoor damp location rated. Power supply shall be IP66 Outdoor Rated.

7. Energy Requirements

The overall power required shall not exceed 2 Watts per square foot for single sided signs, and 4 Watts per square foot for double sided signs.

8. Energy Star Partner

The sign shall be a Energy Star Qualified Product.

9. Quality Assurance

Manufacturer must be ISO 9001 certified.

10. Product Guarantee

Product must be guaranteed for a minimum of three (3) years.

11. Mounting

The IISNS shall be mounted using a Pelco Style, multi swivel bracket or demonstrated and approved

equal.

The Light Emitting Diode (LED) Internally Illuminated Street Name Sign (IISNS) shall be a "Carmanah" Brand LED Back Lit Edge-Lit Internally Illuminated Street Name Sign or demonstrated and approved equal.

THE VERTICAL SUPPORT BARS SHALL BE CONSTRUCTED FROM GALVANIZED STEEL IN LIEU OF ALUMINUM AND SHALL BE "ZAP" BRACKETS OR EQUAL.

D-3.25 EQUIPMENT TO BE REMOVED AND SALVAGED – Equipment to be removed and salvaged shall be delivered to the City of Antioch corporation yard. City staff shall be notified 72 hours in advance prior to delivery. No additional costs will be incurred as a part of the delivery of the equipment.

D-3.26 PAYMENT - Full compensation for performing all the work as shown on the plans, as specified in the Standard Specifications and these Special Provisions, Section D-3, including furnishing all labor, materials, tools, equipment, and incidentals, and performing all alterations necessary to complete the work shall be considered as included in the contract lump sum price paid for "Traffic Signals" at this location, and no additional compensation will be allowed therefor as shown on the plans. An itemized list shall be submitted for the signals, conduit, pull boxes, loops, and other items.

Contra Costa County (CCC) signal maintenance personnel will perform a "compliance inspection" of the traffic signal installation upon contractor completion and generate a "punch list." Once the "punch list" items have been corrected, the CCC signal maintenance personnel will re-inspect the traffic signal installation and sign off on all items that have been satisfactorily completed. If there are items that have not been satisfactorily completed, the "punch list" will be returned to the Contractor for completion. This process will continue until all items have been satisfactorily completed. After the first two-(2) compliance inspections by the CCC signal maintenance personnel, the cost of the inspections will be the responsibility of the Contractor and deducted from payment owed the Contractor.