SPECIAL PROVISIONS
TRAFFIC SIGNALS AND LIGHTING

CITY OF VALLEJO

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Remove, install, and modify traffic signal systems, intersection safety lighting, and street lighting system as shown on the plans. The work of this section shall include all labor, materials, and equipment necessary to complete all installations required to deliver fully operational traffic signal and lighting systems, including interconnect and central control system database, in accordance with the contract documents. (To the consultant) Provide a description of the scope and delete the information that is not needed.

B. Traffic signal work is to be performed at the following locations. (To the consultant) Provide a description of the project here.

C. The Contractor shall be responsible for delivery of a fully operational system(s) and project as shown on the plans and as specified herein.

1.02 PLANS AND SPECIFICATIONS

A. Except as otherwise provided in these Special Provisions, work in this section shall conform to the provisions in Section 86, "Signals, Lighting and Electrical Systems," of the State Standard Specifications dated May 2006 and the State Standard Plans dated May 2006, and the most recent City Standard Details and Specifications, and shall be applicable for any work to be performed within the public right-of-way.

1.03 ORDER OF WORK

A. The first order of work shall be to contact underground service alert (USA) and identify proposed location of poles prior to placing the order for the traffic signal equipment (see section 1.04 Submittals). After the City has approved the signal pole locations, the Contractor can place the order. The Contractor shall furnish the Engineer with a statement from the vendor that the order for said equipment has been received and accepted by said vendor.

B. The Contractor shall apply for and obtain any permits necessary to complete this project. An encroachment and excavation permit from the City will be required depending on the project. If the improvement is a capital improvement project there will be no fees; however, for development improvements the City requires that all fees be paid in advance.

C. All applicable fees including inspection fees, and the bond costs, related to

the permits shall be considered as included in the contract price paid for the various items of work involved and no additional compensation will be allowed therefore.

D. All detector loops shall be cut in the uppermost layer of new pavement. Hot melt rubberized sealant shall be used after first cleaning and blowing all particulate matter and liquids. The waste material shall be captured and handled according the current City requirements and in compliance with the storm water pollution prevention plan (SWPP). No video detection is permitted unless it is authorized for temporary conditions to shift lanes.

E. Unless otherwise approved by the City Engineer, where the sidewalk is removed for the installation of conduits, pull boxes, poles or other work, it shall be re-poured within a week. Temporary or alternative access maybe approved by the Engineer only upon proper notification and traffic control to inform pedestrians, bicyclists, and motorists of new the route.

F. No above ground electrical work shall be performed on any system within the project site until all Contractor furnished electrical materials for the individual system have been tested and delivered to the Contractor. Work which uses processes, equipment, or materials which have not been approved is performed at the Contractor's own risk. Work performed utilizing rejected processes, equipment, or materials will be removed, repaired, or redone at the Contractor's expense to the satisfaction of the City.

G. The Contractor shall notify City of Vallejo Traffic Supervisor at (707) 648-4518 or his designee at least five (5) working days prior to performing any work on the existing signal and street lighting system.

H. Prior to commencement of the traffic signal functional test at any location, all items related to signal and lighting or electrical control shall be completed and roadside signs and all pavement delineation and pavement markings shall be in place at that location.

I. Work which uses processes, equipment, or materials which have not been approved is performed at the Contractor's own risk. Work performed utilizing rejected processes, equipment, or materials will be removed, repaired, or redone at the Contractor's expense to the satisfaction of the City.

J. The Contractor is required to submit a traffic control plan prior to beginning any work. The plan shall include all applicable signs according to the current California Department of Transportation Manual of Uniform Traffic Control Devices (CAMUTCD) standard including any tapers, signs, striping, or

delineation. Lane widths less than 11 feet are not allowed without the permission of the City Engineer.

1.04 SUBMITTALS

A. Unless discussed elsewhere in these technical specifications, the Contractor shall allow 14 working days from the time the documents are received for the Engineer to review all product submittals. The Engineer will indicate in writing on the submittal whether it is approved or denied. If revisions are required, as determined by the Engineer, the Contractor shall revise and resubmit the submittal and shall allow an additional 14 working days from the time the equipment was resubmitted for the Engineer to review the revisions. If any of the Engineer's comments made on the first review are not addressed in the second or subsequent submittals, the Contractor will be charged for the time the Engineer spends reviewing the submittal at the Engineer's current rate with applicable overhead.

B. Submittal equipment shall include but not limited to:

1. Pull boxes
2. Controller type
3. Cable, conductors/wire interconnect
4. Poles
5. Light fixtures
6. Pedestrian push buttons
7. Audible pedestrian indications
8. Optical/cable
9. In-pavement light system
10. Ground rod
11. Conduit
12. Hot meter rubberized sealant
13. Water based lubricant
14. Pedestrian signals
15. Vehicle signals
16. Hardware
17. Back plates
18. Service enclosure/battery back-up
19. Wireless detection

1.05 OBSTRUCTIONS

A. The Contractor shall check the depth and alignment of sanitary sewer (SS) and storm drain (SD) lines prior to crossing over them. The verification can be done by checking manhole and curb inlets on site and the location of District SS cleanouts.

B. If any laterals of the SS and SD lines are excavated under or broken, a separate encroachment permit shall be obtained and paid for by the Contractor.

C. Pull boxes, signal poles, and cabinets shall not be placed over SS and SD facilities. A minimum horizontal separation with a minimum of 1 foot and maximum of 2 feet shall be maintained.

D. Conduit runs shall not be placed longitudinally over SS and SD lines. A minimum horizontal separation minimum of 1 foot and maximum of 2 feet shall be maintained.

1.06 MAINTAINING TRAFFIC

A. The Contractor shall notify the Engineer, Caltrans (if necessary), local authorities, and emergency communications at (707) 648-4448 of the intent to close a roadway or a portion of the roadway at least 5 days before work is to begin. At any time, if the City deems necessary based on traffic conditions, a changeable message sign may be requested to properly inform motorists in advance of the closure at no cost to the City. The Contractor shall cooperate with local authorities relative to handling traffic through the area and shall make his own arrangements relative to keeping the working area clear of parked vehicles.

1.07 HOURS OF WORK

A. Regular working hours are 8:00 a.m. to 4:30 p.m., Monday through Friday, excluding holidays observed by the City. The Contractor shall obtain the Engineer's approval for all work outside these working hours. No lane closures are permitted before 9:00 and after 3:30 or holidays without notifying the Engineer.

B. All inspection work and equipment usage outside the regular working hours as described above or beyond 8 hours per day on any particular job, shall be charged to the Contractor at each inspector's current overtime and vehicle rates with applicable overhead.

1.08 AS-BUILT DRAWINGS

A. The Contractor shall provide and keep up to date a complete set of record drawings. Such drawings shall fully represent installed conditions including actual locations of all underground site utility and interconnect conduits. The Contractor shall record all changes in the work during the course of construction on black line prints. All changes shall be neatly and legibly drawn to scale on the set of prints using standard architectural or engineering drafting practices. A list of the serial number and model of the equipment used at each location shall also be kept. After completion of the job, the as built plans and specifications shall be delivered to the Engineer in both full size hard copy and an electronic format in AutoCAD 2007.

PART 2 MATERIALS

2.01 COST BREAKDOWN (To the consultant) Include this section for CIP projects.

A. The Contractor shall furnish to the Engineer a cost breakdown conforming to section 86-1.03, "Cost Breakdown," of the Standard Specifications for each contract lump sum item of work of this project.

B. The cost breakdown shall be submitted to the Engineer for approval within 15 days after the contract has been approved. The cost breakdown shall be approved, in writing, by the Engineer before any partial payment for the items of work will be made.

C. The cost breakdown shall, as a minimum, include the following items:

1. Controller assembly
2. Service equipment enclosure
3. Foundations - each type
4. Traffic signal standards and poles - each type
5. Conduit - each size and installation method
6. Pull boxes - each type
7. Conductors - each size and type
8. Signal interconnect cable
9. Vehicle signal heads and hardware - each type
10. Pedestrian signal heads and hardware - each type
11. Pedestrian push buttons - each type
12. Accessible pedestrian signals - each type

13. Loop detectors - each type
14. Alternative loop detectors (Sensys) - each type
15. Luminaires or LED luminaires- each type
16. Emergency vehicle detection system - each type
17. LED internally illuminated street name sign - each type
18. Detector handhole - each type
19. In-pavement warning lights (IRWL) - each type

PART 3 EXECUTION

3.01 MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS

A. Traffic signal system shutdowns shall be limited to periods between the hours of 9:00 a.m. and - 3:00 p.m., Tuesday through Thursday, excluding City holidays, the day after City holidays, or during rain unless otherwise approved by the City. The same hours shall apply to signal turn-ons however they shall not begin after 1:00 p.m. All detectors shall be operational, striping or markings and signs in place prior to the turn on. With prior approval by the City Engineer, signals will be allowed to be put on red flash the day before the scheduled turn-on.

B. Existing traffic signals shall remain operational until the day of the turn on of the new signal system. Where an existing traffic signal is to be modified, the Contractor shall maintain at least two (2) indications per direction per movement according to the CAMUTCD until the day of the final switch over, unless otherwise approved by the Engineer. Any damage done to an existing signal by the Contractor shall be repaired within 24 hours, to the satisfaction of the City, except as stated in the following paragraph.

C. If any part of the detector conductor, including the portion leading to the adjacent pull box, is damaged by the Contractor's operations, the entire detector shall be replaced within 48 hours, unless the Contractor is currently working on signal improvements at the affected location, in which case the loop must be replaced within two weeks. If the detector is to be replaced, it may be temporarily spliced, if the work is to be completed within 3 months, with City’s approval prior to the new loop being installed. However, any failure of the detector is the ultimate responsibility of the Contractor to repair or replace. If any adjacent detector is damaged during such replacement, that detector shall also be replaced. Upon final modification or replacement, all the hard wired detector loops shall have a resistance to ground of at least 500 mega-ohms. Documentation in the form of a letter certified by the Contractor shall be supplied to the City.

D. Existing lighting systems shall remain operational. In rare cases when lighting is not functional, temporary lighting can be provided if approved by the City Engineer.

E. At least three working days prior to performing any work on each existing system, the Contractor shall notify the City of Vallejo Traffic Supervisor at (707) 648-4518 or his designee.

3.02 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE

A. The Contractor shall submit a traffic control plan to the City Traffic Engineer or designee for approval prior to installation of any traffic control. No traffic control shall begin until the Contractor's traffic control plan is approved. A traffic control system shall consist of closing traffic lanes in accordance with details shown on the plans and CAMUTCD standards.

B. The provisions in this section shall not relieve the Contractor from the responsibility to provide such additional devices or take such measures as may be necessary to comply with provisions in Section 7-1.09, "Public Safety" of State Standard Specifications.

C. If any component in the traffic control system is displaced, or ceases to operate or function as specified, from any cause, during the progress of the work, the Contractor shall immediately repair the component to its original condition or replace said component and shall restore the component to its original location.

D. Each vehicle used to place, maintain, and remove components of a traffic control system on multilane highways shall be equipped with a Type II flashing arrow sign which shall be in operation when the vehicle is being used for placing, maintaining, or removing components. Vehicles equipped with Type II flashing arrow sign shall not be involved in placing, maintaining, or removing the components when operated within a stationary type lane closure shall only display the caution display mode. The sign shall be controllable by the operator of the vehicle while the vehicle is in motion. The flashing arrow sign shown on the plans shall not be used on the vehicles which are doing the placing, maintaining, or removing of components of a traffic control system, and shall be in place before a lane closure requiring its use is completed.

3.03 STANDARDS, STEEL PEDESTALS AND POSTS

A. Only a side tenon at the end of the signal mast arm will be acceptable.

B. All visible screws shall be theft proof.

C. Handholes for traffic signal standards shall be located 90 degree clockwise from the traffic signal mast arm and away from traffic.

D. Type 1 standards shall be assembled and set with the handhole on the downstream side of the pole in relation to traffic, or as shown on the plans and/or directed by the Engineer.

E. Upon the completed installation, the poles shall be stamped or bead welded at the base plate with the type and year of the specification. Any poles removed and salvaged from operation shall also be labeled prior to delivery to the corporation yard at 111 Amador Street, Vallejo CA 94590.

F. 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.

3.04 TRENCHING

A. Except as otherwise specified in the "CONDUIT" section, at locations where conduit is required to be installed under existing pavement, a City approved method that will not cause damage to the pavement shall be used. However, with advance approval by the Engineer and if delay to any vehicle will not exceed 5 minutes, conduit may be installed by the "Trenching in Pavement Method" as specified in Section 86-2.05C, "Installation," of the State Standard Specifications.

B. When the Trenching in Pavement Method is used, the outline of the area of pavement to be removed shall be cut with a power driven saw to a depth of not less than 4 inches in order to provide a neat and true edge with no shatter outside the removal area. If the trench is within 3 feet of a gutter edge, only one saw cut will be required (on the side of the trench opposite of the gutter) and the asphalt surfacing shall be replaced all the way to the gutter edge. A tack coat shall be applied to the vertical edges just prior to place the asphalt concrete used to cap the trench. The trench shall be filled with 4 inches of red-oxide slurry with safety tape. Please verify refer to the City Standard Detail (XX-X).

C. Damage to pavement which is to remain in place shall be repaired to a condition satisfactory to the City Engineer, or the damaged pavement shall be removed and replaced with new asphalt concrete if ordered by the City Engineer. Repairing or removing and replacing pavement damaged outside the limits of pavement to be replaced shall be at the Contractor's expense and will not be measured nor paid for.

D. Removed materials shall be disposed of outside the highway right of way in accordance with the provisions in Section 7-1.13, "Disposal of Material

outside the Highway Right of Way," of the State Standard Specifications. This material shall become the property of the Contractor. The Contractor shall be responsible for locating a suitable dump site approved by the City Engineer and for transporting the materials for dumping. When the material is to be disposed of at a location other than the local sanitary landfill site, the Contractor shall obtain written authorization from the property owner on whose property the disposal is to be made and he shall file said authorization with the City Engineer together with a written release from the property owner absolving the City from any and all responsibility in connection with the disposal of material on said property. If the dump site is within the City limits, the property owner must obtain a grading permit.

E. Full compensation for securing a dump site, hauling, removing, disposing or stockpiling broken asphalt, concrete, base material and earth and for all other aspects of this section will be considered as included in the contract prices paid for the various items of work and no additional allowance will be made therefore.

F. If the Contractor elects to use “Directional Boring,” the conduit shall be installed between a minimum depth of 24" to a maximum depth of 60" unless directed otherwise by the Engineer. Conduit installed by the Directional Boring Method will be paid for under the various contract bid items for installing conduit including trenching. (To the consultant) Verify with the City what approach to take - this is not an item that should be left to the Contractor to decide.

G. Directional Boring under railroad tracks shall be a minimum of 3'-6" below the railroad ties. No trenching will be allowed within the railroad right of way. The Contractor shall comply with all requirements set forth by the CPUC and other rail authority. (To the consultant) Verify with the City what approach to take - this is not an item that should be left to the Contractor to decide.

H. All existing signs in the way of the trenching operation in unimproved ground shall be salvaged and reinstalled or replaced per plan or as ordered by the Engineer. Each roadside sign shall be reset on the same day that the sign is removed. (To the consultant) Verify with the City what approach to take - this is not an item that should be left to the Contractor to decide.

3.05 CONDUIT

A. All conduits to be installed underground shall be Schedule 40 PVC rigid non-metallic type unless otherwise specified. There shall be no more than 180 degree in bends. An intermediate pull box can be installed to relieve the need for additional bends at the Contractor’s cost. There shall be no empty

conduit legs. Each conduit run shall include a #8 solid bond wire and traceable ¾ inch 2400# traceable pull tape. The pull tape shall be pulled into the conduit with the appropriate conductors, fiber optic, or signal interconnect cable. At least three (3) spare conductors shall be pulled into each signal conduit. The cost of this pull tape shall be considered to be included in the contract lump sum price for traffic signal and no further compensation will be made. All conduits shall include bell ends and duct sealed.

B. When rigid non-metallic conduit is placed in a trench (neither in pavement nor under portland cement concrete sidewalk), after the bedding material is placed and conduit installed, the trench shall be backfilled with commercial quality red oxide concrete and warning tape, containing not less than 376 pounds of cement per cubic yard, to not less than 4 inches above the conduit before additional backfill material is placed.

C. Conduit runs shown on the plans to be located parallel and behind curbs may be installed in the street, within 3 feet of and parallel to the face of the curb, by the trenching in pavement method described in Section 86-2.05C of the Standard Specifications. All pull boxes shall be located behind the curb or at the locations shown on the plans.

D. After conductors have been installed, the ends of conduits terminating in pull boxes, and in service and controller cabinets shall include Bell Ends and be sealed with duct seal or an approved type of sealing compound.

E. At locations where conduit is required to be installed under pavement and existing underground facilities require special precautions, as described in "Obstructions" of these Special Provisions, conduit shall be placed by the "Trenching in Pavement Method" as specified in said Section 86-2.05C.

F. At other locations where conduit is required to be installed under pavement and if delay to any vehicle will not exceed 5 minutes, conduit may be installed by the "Trenching in Pavement Method."

G. Communication conduits shall enter pull box from the side and at an angle not greater than 45 degrees from the horizontal.

H. Conduit bends of communication conduits shall have an angle of no greater than 45 degrees and a radius of no less than 24 inches.

3.06 PULL BOXES

A. All pull boxes placed in earth or planting strip with landscaping shall be set to grade and installed with a minimum 12 inch concrete collar by 4 inch thick and at least 4 inches along the sides of the pull box to the bottom

edge (see City Standard Detail XX-X). All pull boxes shall be theft proof with the installation method approved by the City prior to installation.

B. Grout shall not be placed in bottom of pull boxes. New ¾" graded clean rock shall be used at the bottom of the sump. Any other debris in the bottom shall be removed by the Contractor at the time the project is accepted.

C. The third paragraph of Section 86-2,06C, "Installation and Use" of the Standard Specifications, is amended to read: Where the sump of an existing pull box is disturbed by the Contractor's operations the sump shall be reconstructed.

D. All pull boxes shall be No. 5 except where noted otherwise. For pull boxes with 3 or more conduits entering a No. 6 pull box shall be used. Where more than 4 conduits enter, the N48 (30-1/4" x 48-1/4") shall be used. For all sections of conduit with Fiber Optic or SIC cable, only No. 6 or larger pull boxes shall be used unless otherwise noted on the plans as indicated on the state standard plans.

E. No. 3-1/2 pull boxes shall not be used. Where Standard Plans indicate No. 3 1/2 pull boxes, the No. 5 pull boxes shall be used.

F. Cover marking shall be "CITY OF VALLEJO, COMMUNICATION" for any pull boxes that contain only Fiber Optics or Signal Interconnect Cable (SIC). Cover markings for pull boxes that contain signal conductors shall be marked "TRAFFIC SIGNAL." Street lighting pull boxes shall contain cover markings with "CITY OF VALLEJO, STREETLIGHTING." The lids shall be protected during the course of construction. Any damage to the pull boxes at the time the project is accepted shall be rejected and a new lid installed in its place.

G. Where pull boxes are to be installed over existing conduits that contain signal interconnect cable or fiber optic cable, care shall be taken so that the cable will not be damaged. Any cable that is suspected of being damaged shall be checked to verify there is no damage utilizing an optical Time Domain Reflectometer (OTDR). The Contractor shall supply a letter certifying the integrity and results. Damaged cable shall be replaced to the City's satisfaction at the Contractor's expense. Contractor will be required to make any repairs to allow for the required slack as identified in these Special Provisions.

3.07 CONDUCTORS AND WIRING

A. Splices are not allowed; however, there are some cases when they are unavoidable and used for temporary solutions, typically between 3 and 6 months. As a result, spliced conductors shall be insulated by "Method B"

per the California Department of Transportation Standard Details of May 2006 (ES-13A).

B. All new conductors in the controller cabinet shall be secured and clearly labeled.

C. 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 Standard Specifications for all the conductors and cables furnished for the project.

D. In addition to the requirements for splices in detector circuits, the open end of cable jackets or tubing shall be sealed in a manner similar to the splicing requirements to prevent the entrance of water.

E. At least six (6) feet of slack shall be provided in all pull boxes located nearest the signal standards.

F. Where new conductors are pulled into a conduit which contains existing conductors, all conductors shall be removed and existing and new conductors shall be re-pulled together. If it is decided by the Engineer that the existing conduit cannot be removed due to down time of the traffic signal, the Contractor shall use an approved water based lubricant to pull in the new cable or conductors. All the conductors shall be meggered to verify the integrity of the conductors according to the previous sections in this special provision.

G. All unused conductors including signal interconnect cable (SIC) shall be terminated and neatly banded and appropriately labeled in the controller cabinet.

H. All conductors between the controller assembly and the service and all signal conductors shall be stranded THW.

I. Designated Cable Slack - Throughout the cable plant the Contractor shall be required to pull and store excess cable slack at designated intervals. Theses intervals shall be at each communications pull box, and each hub or controller. The following lengths of slack cable is the minimum City requirement:

1.	No. 6 Pull Box	6 feet
2.	Controller	20 feet
3.	Communication	6 feet

J. Signal cable shall not be used.

K. All wiring shall be connected to a terminal strip and neatly tie wrapped. No wiring shall hang loose.

3.08 SIGNAL INTERCONNECT CABLE (SIC)

A. The SIC shall be specified as BSCC-HDPE-12P 20 AWG-300V-60C, has 12 pairs of #20, stranded, tinned, copper conductors. Alternative shall be Rural Electrical (REA) PE-22. In either case, both types shall meet the Caltrans standard specification for interconnect cable. Each pair has a conductor insulated in black. The other conductor is insulated in color; a different color for each pair. Each pair is shielded and individually wrapped such that the shields are insulated from one another.

B. Throughout the cable plant the Contractor shall be required to pull and store excess cable slack at designated intervals. These intervals shall be each communication pull box, and each hub or controller. Six (6) feet of slack shall be stored at each pull box and twenty (20) feet of slack at main pull box adjacent to each hub or controller cabinet.

C. The existing 24-strand fiber optic cable to be cut shall NOT be spliced. Under temporary conditions, fiber optic cable can be spliced by the industry "fusion method," unless the Contractor recommends another method that is acceptable and approved by the City Engineer. Once the temporary splice is completed, the fiber shall be tested for loss. Any loss greater than 0.25 db shall be re-spliced or a new fiber re-pulled into the conduits. Written verification is required by the Contractor certifying the integrity of the cable.

D. SIC cables shall be secured to the frame of the controller cabinet. Terminate SIC cable on terminal strip. Install a patch cable between the terminal strip and the lightning protection, and between the lightning protection and the modem. Crimp and solder all SIC and patch cable lugs. The cable shall be taped where the sheathing ends.

E. New SIC conductors may be pulled in without removing the existing SIC and/or fiber optic cable when the conduit only contains SIC or fiber optic cable.

F. At the controller cabinet blue-black and red-black are the pairs being used. The other pairs will be spare and tie wrapped accordingly for future use. The end of each wire is stripped, lugged, crimped and soldered with 60/40 rosin core solder, heated with no flame source. Each lug is then screwed to the terminal strip. The two shield wires are soldered together and earth grounded at one end of the cable only. The end closes to the hub.

3.09 SERVICE

A. (To the consultant) See City Standard Detail XX-X. New services will contain battery back-up system (BBS). See section 3.09A and delete this section if not needed.

B. Continuous welding of exterior seams in service equipment enclosures is required.

C. New Type III service equipment enclosures shall be the anodized aluminum type.

D. All overlapping exterior seams and doors shall meet the requirements for Type 3R enclosures specified in the NEMA Enclosure Standards.

E. All multi-pole circuit breakers shall be the internal trip type.

F. All traffic signal circuits shall be metered. All street lights shall be un-metered flat rated.

G. Service shall be a Tesco Type III BF service (Ref. T-17162) or approved equal.

H. Two contactors and two photoelectric units are required (for lighting and LED IISNS).

I. Circuit breakers shall be the cable-in/cable-out type, mounted on non-energized clips. All circuit breakers shall be mounted vertically with the up position of the handle being the “ON” position.

J. Dead front panel or panels, and corresponding exterior door shall be hinged on one side and shall be able to be opened without the use of tools.

K. A barrier type terminal block rated for 40A, minimum shall be provided in each service equipment enclosure. The terminal block shall have a minimum of 12 positions with terminals rated at Size No. 8 or larger, to accept the field wires indicated on the plans. Field wires shall be terminated on the ground/neutral breaker bar.

L. Conduits entering the service cabinet shall be sealed with an approved sealant.

M. Photo electric unit used in the street light circuit in the cabinet shall be time delay.

N. Duct seal shall be used at the base of the service cabinet.

3.09A SERVICE EQUIPMENT

A. The Contractor shall furnish and install the service equipment cabinet and battery back-up system (BBS) as shown on the signal plans and as provided in these standard 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 or equal.

B. Service Enclosure: The service enclosure shall:

1. Be 20” wide X 50” high X 10 ¼” deep
2. Meet EUSERC requirements
3. Include Type V PEU
4. Be fabricated from ⅛” aluminum
5. Be fabricated from 14 gauge cold rolled steel and painted white
6. Be anodized aluminum
7. Have continuous welded seams
8. Have full length dead front with stainless steel hinge
9. Be a UL 508 industrial control panel label for service entrance equipment
10. Have section with removable step
11. Have 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
12. Have hinged dead front with ¼ turn latch & knurled knobs
13. Have core mortise lock with 2 - #2 traffic signal key provided
14. Have dead front door hinged on the same side as exterior door & open a minimum of 100°
15. Have removable back panel mounted on 4 welded ¼” studs
16. Have all circuit breakers mounted in a vertical position, handle up for “ON” handle down for “OFF”
17. Have circuit breakers of cable-in cable-out type
18. Have service enclosure shall consist of absolutely no “Bolt-On” or “Plug-In” circuit breakers
19. Have service enclosure completely prewired in the factory
20. Have wiring to NEMA IIB standards showing external connections and external equipment

21. Have all bussing UL approved copper THHN cable bussing, fully rated

22. Have all circuit breakers, switches and other components function as required

23. Be identified by laminated engraved plastic nameplates with minimum ¼" letters

24. Be fastened with minimum of two #4-40 stainless steel machine screws

25. Have Computer Aided Drafting (CAD) wiring schematics and include all external equipment and connections per NEMA IIB.P8

26. Have As Built factory drawings enclosed in clear plastic and held inside the outer door by welded hooks

27. Have manufacturer furnish independent laboratory certification of metal preparation and finish and confirmation that the overall product meets these specifications

If this agency wishes to witness this testing, all costs are to be paid by the Contractor.

C. Battery Backup System: The battery backup system cabinet shall be anodized aluminum weatherproof enclosure and shall house BBS and batteries. The enclosure shall be TIG welded construction with welding materials specifically designed for the material to be welded. The BBS 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.

The 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. The maximum cabinet dimensions 46" H x 20" W x 10.25" D with a weight of 250 lbs with the batteries. The 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. The batteries shall be installed in fixed position framed trays for seismic safety and be readily accessible for maintenance. The batteries shall be mounted allowing airflow front and back. The BBS enclosure will include two transfer bypass switches, one for BBS bypass the second for auxiliary generator (optional). All the switches shall 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.

D. BBS Panel: The BBS panel shall include the following minimum specifications:

1. 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.
2. BBS bypass and BBS isolation switch.
3. Deadfront safety panel board with all switches, indicating fuses, plugs, and isolation fuses for each battery pre-wired with phenolic nameplates.
4. All nameplates shall be screwed on phenolic engraved type.
5. All wire terminating lugs shall be full wrap around type.
6. All batteries shall be captive spaced from external captive sides in earthquake proof buckets.
7. Cabinet ventilation shall be by (qty. 2) 4" x ¼" louvers top and bottom with encapsulated bug screens, cleanable filters and a 100cfm fan to completely exchange air 25 time minimum per minute.
8. All DC terminals and connections shall incorporate safety covers such that the safety covers are in place for every normal maintenance mode.
9. Event counters and total run time counter.

E. BBS Unit: The BBS units shall include these minimum specifications.

1. The BBS unit shall provide a true sine-wave output with minimum 1400 Volt-Amp continuous capacity.
2. The BBS shall provide for utility service isolation when in operation.
3. The minimum rating for wattage output will be 950 watts.
4. The BBS shall be capable of running an intersection with LED lights (for run time consult manufacturer).
5. 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).
6. The BBS will automatically recharge batteries from full discharge to 95% capacity within 6 hours.

7. The BBS shall provide on-line operation for a minimum input of 92 to 145 VAC.

8. The BBS shall 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.

9. The BBS shall be a UL Approved Design.

3.10 MODEL 170 CONTROLLER ASSEMBLY

A. The Contractor shall contact the City Engineer, at least 48 hours in advance, to schedule the date and time for switch over so the City can arrange to have a qualified personnel on hand to revise the timing parameters for proposed signal phasing operation.

B. Controller shall be type 170 ATC (HC11CPU) with 4 communication ports. A model 400 modem shall be included in each new controller assembly. If two (2) or more intersections are being installed or modified as a part of this contract, one (1) spare modem shall be supplied.

C. All boards in the 170ATC type controllers shall be of socket type design allowing individual chips to be easily removed and replaced.

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

E. The operating program for Model 170 controller unit shall be supplied by the Contractor and shall be fully populated with the latest BI Trans systems, Inc. 233 program. One (1) additional 233 program chip with the latest Bi Tran Systems program shall also be furnished by the Contractor.

F. Each 332 controller cabinet assembly shall be delivered to the City of Vallejo Maintenance Division at 111 Amador Street, Vallejo CA 94590 and tested for 35 days prior to installation. The Contractor will be notified upon completion of the testing and shall then arrange for delivery of the controller assembly to the site of the work. The costs of such testing and transportation and to and from the Maintenance Division shall be borne by the Contractor.

G. The conflict monitor unit shall monitor 16 channels and each shall have its own indicator.

H. An open door sensor shall be provided in the controller cabinet.

I. All terminal strips on new and existing cabinet shall be accessible when

the cabinet is fully assembled.

J. Contractor shall obtain approval from the City for the location prior to installation of the controller assembly.

K. The Contractor shall give the City of Vallejo five (5) working days notice prior to a system turn-on.

L. The bottom of the controller cabinet shall be duct sealed.

M. All wiring shall be connected with any loose wire ties wrapped to a terminal strip. No wiring shall hang loose.

N. There shall be a pull out table type tray mounted beneath the controller for storing of prints and other important information.

3.11 VEHICLE SIGNAL FACES AND SIGNAL HEADS

A. All lamps for traffic signal units shall be furnished and installed by the Contractor. The products qualified for use in the City shall be either Dialight or Gelcore GT1 with incandescent look light emitting diode or equal. Only 12” circular arrow or ball shall be used on new or retrofitted traffic signals. Any alternate shall be submitted to the Engineer for approval.

B. In addition to 3.11, all green, yellow, and red signal sections shall be Light Emitting Diode (LED) type conforming to Section 86-4.02, "Light Emitting Diode Signal Module," of the State Standard Specifications.

C. The designer is responsible for verifying that the mast arm lengths that are listed in the Equipment Schedule provide optimal visibility and clarity for drivers.

D. In cases where poles and arms must be installed in front of existing poles and arms, the Contractor shall assure that there are at least two indications in full view of approaching vehicles per each phased movement.

E. Type SV-1-T mountings with 5 sections and SV-2-TD mountings shall be bolted to the standard through the upper pipe fitting in a manner similar to the terminal compartment.

F. Terminal compartments shall be bronze.

G. The backplate shall be one-piece, louvered, and removable while the signal is in operation.

H. Where existing heads are being reused, new gaskets should be installed.

I. The manufacturer shall provide a written warranty against defects in materials and workmanship for LED signal modules for a period of 60 months (5 years) after installation of LED signal modules. Replacement LED signal modules shall be provided within 5 days after receipt of failed LED signal modules at no cost to the City, except the cost of shipping the failed modules. All warranty documentation shall be given to the Engineer prior to installation. Replacement of LED signal modules shall be delivered to the City of Vallejo.

J. Two (2) spare circular red, green, and yellow ball and arrow indications shall be supplied with each intersection.

3.12 PEDESTRIAN SIGNALS

A. Type SP-1-T mountings shall have a lower mounting bracket attached to the pedestrian signal housing in the same manner as the SP-2-T mounting.

B. All pedestrian signal faces shall be Light Emitting Diode (LED) countdown type conforming to Section 86-4.07 "Light Emitting Diode Pedestrian Signal Face "upraised Hand" Module," of the Standard Specifications, and shall be listed on the current Pre-Qualified Products List Maintained by Caltrans.

C. Pedestrian signal units shall be Gelcore, Dialight, or approved equal countdown type with hand/man filled with LEDs. No hand/man outlined LEDs will be allowed. The countdown feature is only allowed to countdown the flashing “Don’t Walk” per the CAMUTCD.

D. The Contractor shall provide the City a Certificate of Compliance from the manufacturer in accordance with the provisions of Section 6-1.07 "Certificates of Compliance," of the Standard Specifications. The certificate shall certify that the LED pedestrian modules comply with the requirements of these specifications. The certificate shall also include a copy of all applicable test reports on the LED pedestrian modules.

E. LED pedestrian modules shall be guaranteed by the Contractor for a period of five years starting on the day after the project is accepted by the City. Modules that fail during this period shall be removed and replaced by the Contractor at no cost to the City.

F. One (1) spare LED pedestrian signal module shall be provided with each intersection.

3.13 DETECTORS

A. Loop detector lead-in cable shall be Type B.

B. Detector card shall be back lit LCD digital readout capable of detecting all status and function settings. The unit shall be capable of audible detect for loop and detector troubleshooting. Programmed detector parameters shall be stored in non-volatile memory. The unit shall be downward compatible. The LCD screen shall read out real-time loop frequency, loop inductance, a bar graph indication of relative inductance change, record of accumulated loop failures, and a timer countdown of programmed timing functions.

C. All detector cards shall be delivered to the City of Vallejo Maintenance Division for testing. Ten percent (10%) of the cards will be tested to determine if they miss calls at an average sensitivity or if they "lock up" at high sensitivity. If it is determined that a significant portion (10%) of the tested detectors cards fail this test, the brand of detector cards will be rejected for use in the project and a different brand shall be submitted.

D. Where loops are to be installed partially in concrete, the installation of the detector shall be installed in such a manner as to provide a coupled Schedule 40 PVC expansion fitting to allow flexing and differential settlement of two pavement types. (See City Standard Detail XX-X)

E. Where loops are cut into the top lift of the flexible or rigid pavement, an approved hot melt rubberized asphalt sealant according to section 86-5.01A(5) of the State Standard Specifications shall be used.

F. The traffic loops homeruns shall be twisted then spliced to the lead in cable in the pull boxes. Splices shall be soldered using rosin core 60/40 (tin to lead ratio) solder. The heat source shall be without flame. Each splice is first wrapped with rubber splicing tape then electrical tape. The tape is then covered with liquid scotchkote for the final seal.

G. Loop wire shall be Type 2.

H. A Modified Type E Loop shall be used at the stop bar (To the consultant) See City Standard Detail XX-X. The remaining loops shall be Type E per Caltrans Standard Plans. The sides of the slot shall be vertical and the minimum radius of the slot entering and leaving the circular part of the loop shall be 1 1/2 inches. Slot width shall be a maximum of 3/4 inch.

I. Detector loops shall be installed on top of the upper most lift of pavement so that they are visible. Replacement of the pavement shall conform to Section 0930, “Asphalt Concrete Paving and Related Work,” of the

Technical Specifications.

J. One (1) additional detector card shall be supplied with each intersection being modified or of new construction.

3.14 ALTERNATIVE DETECTION FOR PRIVATE DRIVES

A. Sensys wireless detection or equal shall be used in cases where private drives limit the installation of in pavement traffic detection loops. Although still an invasive solution, the magnitude of construction required to install the units is significantly less. Installation procedures shall follow those recommended by the manufacturer. The specific equipment needed for installation are as required.

1. Wireless Sensor – Wireless magnetometer equipped with a low power battery for in pavement installation
2. Access Point – Device that operates under the Linux system that maintains two-way wireless links at an installation sensor and repeaters, providing time synchronization, configuration commands, and message acknowledgements
3. Repeaters – Extends the range of sensors and access points
4. Contact closure card
5. One (1) spare wireless sensor shall be supplied with each approach installed, contact closure card, and repeater

3.15 PEDESTRIAN PUSH BUTTONS

A. The pedestrian push button shall be Type A with directional color symbols identifying the meaning of the walk and don't walk symbols. The push button shall be Dick Campbell DCC 200 or equal with micro-switch.

B. Pedestrian push button housing shall be mounted with the actuator button at 3 feet above the adjacent finished sidewalk or pavement grade, or as directed by the Engineer.

C. The actuator surface of all pedestrian push buttons shall have a diameter of 2 inches or greater, shall meet all ADA standards and shall be made of stainless steel.

D. Screws use on pedestrian push button signs shall be theft proof and the removal tool shall be provided to the City of Vallejo by the Contractor.

E. Push button housing shall be metal.

F. Pedestrian push buttons shall be Type B with appropriate signs that meet

ADA standards.

G. One (1) spare unit shall be supplied with the project.

3.16 AUDIBLE PEDESTRIAN SIGNALS (APS)

A. APS signal indications shall be supplied with the intersection, but not installed unless specified in the plans. A spare unit shall be supplied with each intersection. (To the consultant) Determine from City whether the APS units will be installed as well as what type is to be supplied - the consultant will need to verify what will be required for the project.

B. APS Standalone: A Novax DS100 or equal shall be supplied with the project for all directions as supplied by WP Signal. The units shall be capable of providing cuckoo/chirp chirp customizable for recorded voice message with dynamic voice volume compensation. The dynamic proportional volume compensation shall monitor ambient noise level and adjusts output to ensure audibility of signal. The units shall be mounted directly above the pedestrian indication.

1. Electrical: 4 wires 20 gauge. (120 VAC from pedestrian indicator)
2. Power: 115VAC ±20VAC, 60Hz, 3 Watts
3. Transient Protection: Common mode; fuse
4. Dimensions: cm: 13L x 10W x 13H (5” x 3.75” x 5”)
5. Output: Infinitely adjustable from 0 to 90 dB @1 meter
6. Output self-adjusts to +5 dB above street noise level, up to a maximum of 90 dB
7. Color: Standard grey dry powder coated; other colors customer specified
8. Temperature: Operational from -37°C to +74°C (-35°F to +165°F)
9. Enclosure: Weather-proof housing; external adjustments - no dismantling required
10. Loudspeaker: Water proof, UV resistant, vinyl impregnated cloth
11. Mounting: Positive lock heavy-duty swivel
12. Weight: Approximately 0.3 Kg (0.75 lbs)

C. APS Audible and Pedestrian Enclosure: The City has the option of requesting the Navigator or equal for unique highly pedestrian oriented locations. The units shall be self contained with vibro-tactile ADA compliant 2" push button with a raised directional arrow and audible sounds during all pedestrian cycles. Sounds shall be emitted out from behind the unit via a recessed weatherproof speaker. A custom voice-on-

location message shall be provided with an extended push of the button. The message shall give information about the intersection and street being crossed. These additional features shall be included: (To the consultant) Please remove this section if it does not apply.

1. Independent minimum & maximum volume settings for locate sounds, clearance sounds and walk sounds
2. Extended button push and volume overrides under logic control
3. Global configuration changes
4. Clearance sounds or audible countdown of remaining seconds during clearance; complements or replaces visible countdown displays
5. Secure configuration
6. System can self-test and fault report to a remote site for real-time monitoring and system maintenance
7. Button rated for 100 million+ operations with > 2 lb. actuation force
8. User selectable multiple language support option available; can be programmed with up to three pedestrian selectable languages
9. Maximum volume dynamic range 60 dB
10. Announcement of direction of travel (ex: "traveling west") can be added (in field) to location message
11. Extended push priority (mutes entire intersection except selected crosswalk to minimize confusion caused by other sounds)
12. Synchronized sounds throughout intersection; reduced noise clutter
13. All inputs and outputs optically isolated that eliminates pedestrian button isolators
14. Provide special messages throughout intersection such as "Emergency vehicle approaching, please clear intersection immediately," or a similar warning message regarding an approaching train if desired
15. Push button failures or system failures default to transmitting a constant pedestrian call; standard pushbuttons can fail open
16. Adjustable extended push time from 1 to 4 seconds in .5-second increments can be set by installer
17. One (1) additional pole-mounted navigator unit shall be supplied with the project

3.17 LED INTERNALLY ILLUMINATED STREET NAME SIGNS

A. Internally illuminated street name signs shall be light emitting diode (LED)

back lit/edge-lit internally illuminated street name signs.

B. 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.

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

D. 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.

E. 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.

F. 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 CAMUTCD Section 2A.08.

G. 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.

H. The power supply shall be 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.

I. The vertical support bars shall be constructed from galvanized steel in lieu of aluminum and shall be Zap brackets or as approved by the Engineer. As an alternative, another bracket, the Bigfoot, can be provided as long as a safety cable is mounted from the sign to the pole. (To the consultant) Prepare a detail of either the Bigfoot or Zap bracket using a safety cable and verify with Public Works or Maintenance.

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

3.18 HIGH PRESSURE SODIUM LUMINAIRE (INTERSECTION SAFETY LIGHTING)

A. This section applies to intersection traffic signal lighting. Cobra Head type luminaire shall be General Electric, Type M-400A, Model MDCL (Insert lamp wattage) S 1 A 2 1 F MC3 2 or approved equivalent prior to bid.

B. All luminaires shall be multi-voltage ballasts.

C. All luminaires shall be of the cutoff type, Type III distribution, auto-regulating transformer, and (with or 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 as approved by the Engineer and confirmed by Signal Maintenance.

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

E. The lighting circuit shall be 120 volts.

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

G. Luminaires shall contain a locking type mounting receptacle in accordance with EEINEMA standards for photoelectric control. The receptacle shall be pre-wired to the terminal board and be of the screw down type. Upon any pole modification containing lighting, the Contractor shall obtain street light identification numbers from PG&E and verify rate schedule with the Engineer.

H. Luminaire shall consist of a precision die-cast aluminum housing, glove ring, and power/module door. At the completion of the project the Contractor shall obtain the required City numbers and apply the numerals according to the required specification.

I. Ballasts shall operate on 120 VAC with constant wattage auto-regulating (CWA). All 200-watt ballasts shall be 55 volt (Type S-55).

J. Traffic Signal Safety Lighting Lamps shall be high-pressure sodium with a minimum rated life of 24,000 hours.

K. Type IV shall be used unless otherwise indicated and shall have a minimum rated life of 12 years.

3.19 LIGHT EMITTING DIODE (LED) STREET LIGHTING

A. The Contractor shall supply LED street lighting fixture manufactured by Beta. If an alternative is submitted it must be provided prior to the bid. Fixture housing is all aluminum construction. Standard fixture utilizes terminal block for power input suitable for #6 AWG wire and operates at 525mA. Drive current is field switchable on 20 and 30 LED units. The appropriate wattage according to the plans shall be provided. The unit shall be warranted for a period of 5 years with 10 years on the paint and finish with a life rating of at least 50,000 hours.

B. Luminaire Efficiency: Allow for thermal and optical losses. Initial delivered lumens less thermal losses should be less than 10% when operated at a steady state at an average ambient operating temperature of 25°C, and optical losses should be less than 15%.

C. Depreciation: Average delivered lumens over 50,000 hours should be minimum of 85% of initial delivered lumens.

D. Light Distribution: Specify light distribution required and IESNA luminaire classification (LCS). Luminaire to have independent photometric test reports.

E. Maximum System Wattage (including driver loss): Calculate delivered lumens/total wattage. This provides a timeless specification. If LED lumens/watt increase between the time of specification and the time of product ordering you will either get more light for the same energy or be able to reduce the wattage to obtain the same delivered lumens. Do not accept LED wattage only (a "90 watt" LED fixture shall be driven at 700 mA and have a system wattage of 250 watts)

F. Electronic: Requirements are indicated below.

1. Voltage range shall be (120-277) +/- 10%
2. Current .35 Add (+/- 5%)
3. Frequency 50/60 Hz
4. Power Factor >90% at full load
5. THD <20% at full load
6. Load regulation: +/- 1% from no load to full load
7. Output ripple <10%
8. Output should be isolated
9. Case temperature rated for -40º through +80 º
10. Overheat protection

11. Self-limited short circuit protection and overload protected

12. Primary fused

3.20 EMERGENCY VEHICLE PRE-EMPTION SYSTEM

A. Emergency vehicle preemption hardware shall be "Opticom Traffic Control System," identical to and fully compatible with the existing fire preemption equipment in use at the local fire district or as updated versions by the same manufacturer.

B. The Contractor shall install Preempt equipment as follows:

1. Opticom Detector Unit (ODU) - Model Number 711, 721 or 722 as identified 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.

The Contractor shall remove and reinstall the indicated optical detectors from the existing traffic signal emergency vehicle pre-emption (EVP) system. The Contractor shall install the removed optical detectors using new detector cables and providing all wiring necessary in the controller cabinet to provide a complete and operable system, as shown on the plan, and according to the manufacturer's recommendations. New optical cable furnished by the Contractor shall be 3M Company, Opticom brand.

C. The Contractor shall mark the optical detector location for the City to verify prior to the actual installation.

D. All optical cables shall be labeled in the controller cabinet and in the pullbox adjacent to the signal standard with appropriate phase designation.

E. The optical cable shall have a minimum of four feet of slack in the controller cabinet.

F. The Contractor shall have a representative of the 3M Company perform all optical equipment connections in the controller cabinet.

G. The Contractor shall demonstrate that the optical equipment installed perform satisfactorily as a system. Satisfactory performance shall be determined by having the 3M Company representatives verify that the system is properly installed per the manufacturer's recommendations

H. Two 3M Company representatives shall have their own vehicle, equipped with a Class II (emergency) optical emitter assembly, and two-way radios to perform the test.

I. Adjust (fine-tune) the timing range as necessary and re-test.

J. One (1) spare optical detector shall be supplied.

3.21 IN ROADWAY WARNING LIGHTS (IRWL)

A. In general, the IRWL shall conform to the CAMUTCD requirements for installation. Any deviation shall of this shall be prepared on letterhead and submitted to the Director of Public Works for review.

B. System Controller: The system controller shall be model SC-TS1000 as distributed by Traffic Safety Corporation or an approved equal prior to bidding. In order to be approved equal, the proposed device must satisfy the following requirements

1. System controller must support multiple CA MUTCD compliant regular and enhanced flash patterns and be capable of activating different enhanced patterns per system activation.
2. Output pattern operation and power limitations with the primary DC.
3. Power Output where on 12 VDC models the maximum DC power output of the primary is 96 watts. The output pattern selected by pattern selector, Secondary DC Power Output: On 12 VDC models the maximum DC power output of the secondary is 96 watts. The output pattern selected by output mode selector switches: 1 -Same as primary; 2 - In Sync with primary, but non-enhanced; 3 - Non-enhanced complement of primary; 4 - Continuous flashing. The outputs support continuous, flashing and wig-wag operation. The combined DC Power output for 12 VDC models is 120 watts maximum. The AC AUX power output on AC auxiliary output is 360. The AC AUX Outputs are synchronized with DC outputs. The outputs support continuous, flashing and wig-wag operation.
4. System controller must be based on an integrated, high speed 8-bit microcontroller with non-volatile firmware and memory. All settings must remain intact in loss of power.
5. System controller must include the following controls and indicators:
    a. Power indicator system must include a visual indicator lamp for system power.
    b. The activation duration setting must be field adjustable in

one second increments with a range from 1-99 seconds and indicated on digital numeric display.

c. The flash pattern setting must be field adjustable and indicated on digital numeric display.

d. The push button test and indication must include an internal push button for on-site testing and a visual indicator lamp for internal or external push button or activation device signals.

e. The override switch must include an internal switch for constant-on system activation.

f. The output indicators must include visual indicator lamps for system activation, primary output, and auxiliary output.

6. System must support activation from standard contact-closure type push buttons, talking push buttons and/or pedestrian sensor.

7. System must support a field selected extend option for system activation, to allow or disallow re-triggering of the activation period.

8. System must include an adequate number of clearly labeled and/or color coded terminal blocks for system installation. Terminal blocks must be located to provide adequate access to the installer.

9. System protection:

a. Input AC voltage must be protected by a thermal/magnetic circuit breaker.

b. DC electronics must be electrically isolated from AC input voltage.

c. AC to DC converter must include transient surge protection or an external transient surge protection device must be used.

d. AC and DC outputs must be protected with replaceable fuse.

e. System must be enclosed in a NEMA 4 rated enclosure or better. System must include a No. 2 cabinet lock or better.

10. System shall be housed in an aluminum NEMA 4 enclosure (19" H x 14" W x 7.5" D) with a No. 2 lock to provide protection from adverse weather and security from unauthorized access.

11. Warranty - The system controller shall be warranted against defects in workmanship and materials for one year from date of shipment and be eligible for a 5-Year Limited System Warranty.

C. In-Pavement Fixtures: The fixture shall be model FI-TS600 distributed by Traffic Safety Corporation or approved equal prior to bidding. In order to be considered equal, the alternate fixture shall satisfy the following requirements.

1. Construction - The fixture shall be bi-directional and easily convertible to uni-directional to meet site specific requirements and of modular design comprised of a top casting and two (2) pre-focused optical cartridges made of high tensile strength aluminum alloy. The fixture shall be 0.00" above grade when mounted in the factory supplied mounting base. The diameter of the fixture shall not exceed 8" and all mounting hardware shall be stainless steel.

2. Durability - The fixture shall withstand a static load of 44,000 lb. without sustaining permanent deformation or cracking of materials. Leads, gaskets, etc. shall be rated to withstand 300 degrees F.

3. LED/Light Cartridge - Each lens shall be molded of high performance optical grade glass and formed in a removable factory sealed optical cartridge. Two cartridges required per fixture. Each cartridge consumes 4.2 watts per cartridge (8.4 watts per fixture) during the activation period of the fixture.

4. Photometric Performance - The fixture shall have both daytime and nighttime visibility exceeding that of a 50-watt halogen lamp, using a yellow light.

5. Finish - The fixture shall be anodized natural aluminum and be dark grey in color.

6. One (1) spare fixture shall be supplied with the system.

D. LED Crossing Sign: The LED crossing sign shall be model SI-TS30 as distributed by Traffic Safety Corporation or approved equal. In order to be approved equal, the proposed device must meet or exceed the following requirements:

1. Sign Substrate - The sign substrate shall be highway grade 0.08 inch aluminum backing to provide durability and resist corrosion.

2. Reflective Sheeting - The reflective sheeting shall be fluorescent yellow-green, 3M-Diamond-grade sheeting with an Anti-graffiti overlay to maximize visibility under all weather conditions, day or night and provide resistance to vandalism.

3. Light Emitting Source - High Intensity Luxeon LEDs with a life expectancy of over 100,000 hours shall be used. Power consumption shall be approximately 3.6 watts (pedestrian crossing sign) and 3.0 watts (school crossing sign). Pedestrian crossing signs shall employ eight LEDs. School crossing signs shall employ five LEDs. Each LED shall be sealed in a 7/8 inch diameter, heat dissipating plastic enclosure to provide resistance to weather and vibration. All LED enclosures shall be mounted in a 1 inch hole and ultrasonically welded to the sign assembly to provide maximum

strength and rigidity.

4. Wiring - All wire used shall conform to military specifications MIL-W-16878D, Type D vinyl nylon jacket and covered and secured to the sign assembly using a 1 inch x 3/8 inch aluminum extrusion to provide resistance to weather and tampering.

5. LED Connectors - All LED connectors shall conform to Ingress protection (IP-67 rating), be dust proof, and provide protection from temporary immersion in water up to 3 feet deep for 30 minutes. Connectors shall be Deutsch DTM series.

6. Mounting - Signs shall include mounting provision for mounting to poles and posts (supplied by other vendors) and include vandal-resistant mounting hardware (bolts, washers, vandal-resistant nuts) and custom tool for securing vandal-resistant nuts.

7. Models - Signs shall be available in both pedestrian crossing and school crossing models in both 30 inch and 36 inch versions, in 12 VDC and 120 VAC versions.

8. Warranty - The TS30 shall be warranted against defects in workmanship and materials for one year from the date of shipment and is eligible for TSC's 5-Year Limited Warranty.

E. Mounting Base: Fixtures shall be installed in a mounting base *(TSCs # BA-725-10-2)* of high strength steel, hot dip galvanized after fabrication per ASTM-153 specifications, with a 7.25" diameter bolt circle, a 0.75" mud ring, and standard base depth of 10". The base shall be supplied with stainless steel bolts and a plywood cover to protect the mounting flange during installation. The height of the base shall be adjustable using spacers or extensions to facilitate roadway resurfacing.

F. Guaranteed Warranty: The manufacturer of the required optical priority control system will warrant that the provided priority control system has been properly installed, operated and maintained, component parts of a matched component system that prove to be defective in workmanship and/or material during the first five years from the date of shipment from the manufacturer will be covered in a documented system-protection plan, plus an added five-year warranty for repair or replacement at a fixed deductible charge for a total of ten (10) years of product coverage. The protection plan will warrant that component parts of a matched component system that prove to be defective in workmanship and/or material during the first five years from the date of shipment from manufacturer will be repaired at no charge, and that extended coverage with a fixed repair deductible will be available for an additional five years. In total, the warranty coverage must assure 10-year operational reliability and interface compatibility with future components designed for the system. A copy of the manufacturer's warranty shall be supplied with the bid.

G. System Operation: The Contractor shall demonstrate that each system will perform satisfactorily. Satisfactory performance shall be determined using the following test procedure:

1. Each system to be used for testing shall consist of an optical emitter assembly, an optical detector, at least 200 feet of optical detector cable and a discriminator module.

2. The discriminator modules shall be installed in the proper input file slot of a Model 332 controller cabinet.

3. Two tests shall be conducted; one using a Class I signal emitter and a distance of 1,800 feet between the emitter and the detector, the other using a Class II signal emitter and a distance of 2,500 feet between the emitter and the detector. All range adjustments on the module shall be set to "Maximum" for each test. Test shall show that all systems function as described herein and that the channels are assigned correctly. The following shall be the channel assignments; Channel A shall be for phases 2 and 5, Channel B shall be for phases 4 and 7, Channel C shall be for phases 1 and 6, Channel D shall be for phases 3 and 8.

4. Each above test shall be conducted for each channel of the system.

5. Each above test shall be conducted for a period of one hour, during which the emitter shall be operated for 30 cycles, each consisting of a one minute "on" interval and a one minute off interval. During the total test period (1) the emitter signal shall cause the proper response from the Model 170 controller unit during each "on" interval and (2) there shall be no improper operation of either the Model 170 controller unit or the monitor during each "off" interval.

6. The Contractor shall provide all equipment necessary to perform the tests.

3.22 NUMBERING ELECTRICAL EQUIPMENT

A. The Contractor shall place the numbers on the equipment as shown on the plans or as directed by the City.

B. Reflective numbers shall be applied to a clean surface. Only the edges of the numbers shall be treated with edge sealer.

C. Where shown on the plans, 5-digit, self-adhesive equipment numbers shall be placed for all electroliers, soffit lighting, sign lighting and service pedestals, the numbers shall be placed on the front door. On electroliers, the numbers shall be placed as shown on Standard Plan ES-6A.

3.23 PRE-SYSTEM TURN-ON PROCEDURE

A. System shall be fully functional and Contractor shall safety check all items before system turn-on is requested.

B. All equipment shall be installed and aimed appropriately before system turn-on is requested.

C. All signals must remain covered until the day of the scheduled turn-on. Contractor must flash signal, viewing flash verification through small holes cut in the signal face coverings, and before system turn-on is requested.

D. All roadway work, striping, signing etc shall be complete before system turn-on is requested. All detector loops shall be installed and verified as functional before system turn-on is requested.

E. All cameras shall be installed and detection zones shall be programmed before a system turn-on is requested.

F. Controller representative must make and appointment to City Traffic Engineering staff to pick up the signal timing sheet. Controller representative must input timing into the controller and cut diode board before system turn-on is requested.

3.24 TURN-ON PROCEDURE

A. Temporary all way STOP equipment must be installed before the scheduled turn-on time. If equipment is not in place, City will cancel the scheduled turn-on due to Contractor default. It will be Contractor's responsibility to reschedule the system turn-on for a later date that corresponds to Traffic Engineering staff schedule.

B. If any equipment is missing or not completely installed at the time of the scheduled system turn-on, City will cancel the scheduled turn-on due to Contractor default. It will be Contractor's responsibility to reschedule the system turn-on for a later date that corresponds to Traffic Engineering staff schedule.

C. If controller is not programmed with signal timing or diode board is not cut at the time of the scheduled system turn-on, City will cancel the scheduled turn-on due to Contractor default. It will be Contractor's responsibility to reschedule the system turn-on for a later date that corresponds to Traffic Engineering staff schedule.

D. If representative for the controller and the camera are not present at the time of the scheduled system turn-on, City will cancel the scheduled turn-

on due to Contractor default. It will be Contractor's responsibility to reschedule the system turn-on for a later date that corresponds to Traffic Engineering staff schedule.

E. During the scheduled turn-on, Contractor shall remove covers from signal heads and signal shall be completely flashed-out. At this time emergency vehicle detection equipment will also be verified.

F. Once signal is fully flashed, signal will be put into all-red flash.

G. Contractor shall remove all covers from signs and conflicting or unnecessary signage including temporary STOP equipment.

H. Contractor shall place signal into full operation.

I. City, Contractor, and representative/s shall observe signal operations and make adjustments as necessary.

3.25 REMOVING, REINSTALLING OR SALVAGING ELECTRICAL EQUIPMENT

A. Salvaged electrical equipment and SIC shall be hauled to the City of Vallejo yard. For delivery destinations and instructions, contact City of Vallejo Maintenance Division, 111 Amador Street, Vallejo CA 94590, (707) 648-4518.

B. Unless directed otherwise, salvaged signal poles shall be hauled to the City of Vallejo yard on Lemon Street, Vallejo. Salvaged signal heads and controllers shall be hauled to the City of Vallejo yard at 1046 Virginia Street. All materials shall be neatly stacked.

C. The Contractor shall provide equipment, as necessary, to safely unload and stockpile the material. The Contractor shall notify and coordinate with Maintenance Division staff prior to delivery.

D. The Contractor shall remove the existing traffic signal poles and pedestrian push button poles as shown on the plans. Removal shall be accomplished by sawcutting at the base of the poles without disturbing the foundation. The sawcutting at the base shall be done to the top of sidewalk elevation and shall not create an obstruction or any tripping hazard on the sidewalk.

E. Full compensation for removing, reinstalling or salvaging electrical equipment shall be considered as included in the contract lump sum prices paid for signal modification work and no additional compensation will be allowed therefore.

F. If so indicated on the plans, the Contractor shall remove and dispose of existing equipment and material no longer required. Full compensation for removal and disposal of said equipment and material shall be considered as included in the contract lump sum or unit prices paid for the various items of work involved and no additional compensation will be allowed therefore.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT/PAYMENT

A. Payment for traffic signals shall be in accordance with Section 86-8, "Payment," of the Standard Specifications and these Special Provisions.

B. The work shall include excavation of pavement and earth, installation of conduit and backfilling per City of Vallejo's standard backfill procedure including replacement of the pavement, which shall conform to Section 0930, "Asphalt Concrete Paving and Related Work," of the Technical Specifications, installation of the lighting systems per City of Vallejo standard lighting systems.

C. Payment for installing the 3-inch conduit, including furnishing all labor, materials, tools, equipment, and incidentals shall be per bid. The work shall include excavation of pavement and earth, installation of 3-inch conduit and backfilling per City of Vallejo's standard backfill procedure including replacement of the pavement, which shall conform to Section 0930, "Asphalt Concrete Paving and Related Work," of the Technical Specifications.

D. Payment for removing and relocating existing traffic signal pull boxes, including furnishing all labor, materials, tools, equipment, and incidentals, as shown on the plans. The work shall include excavation of pavement and earth, removing and relocating traffic signal pull boxes and associated wiring and backfilling per City of Vallejo's standard backfill procedure including replacement of the pavement, which shall conform to Section 0930, "Asphalt Concrete Paving and Related Work," and replacement of concrete shall conform to Section 0700, "Concrete" of the Technical Specifications.

E. Full compensation for relocating and reinstalling existing electrical equipment, including furnishing all labor, materials, tools, equipment, and incidentals, as shown on the plans shall be considered as included in the lump sum contract price for the traffic signal and lighting installation and no additional compensation will be allowed therefore.

F. Payment for replacement of the pavement in the loop area shall conform

to Section 0930, “Asphalt Concrete Paving and Related Work,” of the Technical Specifications.

G. Full compensation for hauling and stockpiling electrical material shall be considered as included in the contract lump sum prices paid for signal, lighting, and signal interconnect and no additional compensation will be allowed therefore.

H. All other aspects of conforming to the requirements of this section shall be considered as included in the prices paid for the various contract bid items of work and no additional allowance will be made therefore.

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END OF SECTION