DESCRIPTION
This work shall consist of furnishing and installing Model 336 Stretch (336S) Cabinet and auxiliary equipment in accordance with the contract documents and as directed by the Engineer.

All components supplied under this specification shall be listed on the CalTrans Qualified Product List (QPL) that is in effect on the issue date of this invitation. In the case of the modified 336S Cabinet, the vendor’s standard model shall be listed on the CalTrans QPL that is in effect on the issue date of this invitation. All auxiliary equipment shall be listed on the CalTrans QPL that is in effect on the issue date of this invitation. Equipment that is not defined by the CalTrans “Traffic Signal Control Equipment Specifications” (TSCES) or “Transportation Electrical Equipment Specifications” (TEES) that is in effect on the issue date of this invitation is not covered by this requirement. For each piece of equipment that is covered by this requirement, the vendor shall submit a notarized certification the equipment is listed on the QPL that was in effect as of the date of issue of this invitation. Failure to provide this certification shall cause the bid to be rejected as unresponsive. If during the course of the contract, any piece of equipment ceases to be listed on the current QPL, the Engineer may require the vendor to provide a suitable replacement that is listed on the current QPL at no additional cost.

MATERIALS
Requirements. All materials furnished, assembled, fabricated and installed shall be new, corrosion resistant and in strict accordance with the latest provisions set forth by the California Department of Transportation (CalTrans) Specifications.

The specifications for the Model 336S Cabinet and auxiliary equipment shall conform to the requirements in CalTrans documents TSCES and TEES, and to all addenda thereto current on the issue date of this invitation.

This specification shall consist of a wired Model 336S Cabinet with all auxiliary equipment, and cable harnesses required to control the site-specific project intersections and interface with the communications systems shown on the plans, as specified in these specifications, and as ordered by the Engineer. Model 2070L Controller Units shall not be furnished under this item.

As a minimum or as required this item shall include, but not limited to, the following equipment:

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>336S</td>
<td>1</td>
<td>Model 336 Stretch Cabinet</td>
</tr>
<tr>
<td>210</td>
<td>1</td>
<td>Enhanced Conflict Monitor Unit with Red Monitoring Kit</td>
</tr>
<tr>
<td>200</td>
<td>6</td>
<td>Solid State Switchpack</td>
</tr>
<tr>
<td>204</td>
<td>2</td>
<td>Flasher Unit</td>
</tr>
<tr>
<td>222</td>
<td>4</td>
<td>Dual Channel Loop Vehicle Detector</td>
</tr>
<tr>
<td>242</td>
<td>2</td>
<td>Dual DC Isolation Module</td>
</tr>
<tr>
<td>430</td>
<td>4</td>
<td>Flash Transfer Relays</td>
</tr>
<tr>
<td>-</td>
<td>12</td>
<td>Flash Program Plugs (8 red, 2 yellow, 2 white)</td>
</tr>
<tr>
<td>-</td>
<td>10</td>
<td>2w/4k bleeding resistors for unused outputs</td>
</tr>
<tr>
<td>-</td>
<td>1</td>
<td>Mounting Bracket Assembly (Pole Mt. Only)</td>
</tr>
<tr>
<td>-</td>
<td>1</td>
<td>Aluminum Cover Plate for Cabinet Bottom (Pole Mt. Only)</td>
</tr>
<tr>
<td>-</td>
<td>1</td>
<td>6-Port Ethernet Switch</td>
</tr>
</tbody>
</table>

All unused equipment shall be delivered to the Engineer in the original manufacturers packaging.
Model 336S Cabinet.

Dimensions. The cabinet shall be a Model 336 Stretch type with a minimum height of 1170mm and maximum height of 1220mm, width of 610mm, and a depth of 560mm.

The unoccupied rack space of the Model 336 Stretch Cabinet shall be provided at the bottom of the cabinet.

Locks. The cabinet doors shall be equipped with a brass cylinder lock keyed for a Number Two Corbin Key, with a dust cover. Two (2) keys for each cabinet shall be furnished and provided in the cabinet drawer.

Finish. All surfaces of the cabinet shall be bare, unpainted aluminum.

Police Door. The front door of the cabinet shall be equipped with an auxiliary police access door. The police access door shall include a Signal ON/OFF switch, Flash/Auto switch, and an Auto/Manual switch with police cord. One (1) police master key and one (1) police cord in the original manufacturer’s anti-static packaging shall be provided in the cabinet drawer.

Cabinet Light. Fluorescent lamps shall be installed in the top of the front and rear of the cabinets. Switches shall be installed on the front and rear doors. Opening of either door shall illuminate both lights.

Each fluorescent lamp and switch shall be equipped with noise suppression devices. Activation of the fluorescent lamps and associated switches shall not cause any disruption of the Model 2070L Controller or any other electrical device in the cabinet. The vendor shall install sufficient RFI and surge suppression equipment to assure that operation of the fluorescent lamps will not disrupt the operation of other equipment in the cabinet.

Fluorescent lamps and associated ballast transformers shall be rated for high output in cold environments, providing high light output in ambient temperature of -25°C.

The cabinet lamp circuit shall be fused. The fuse holder shall be easily accessible from the front of the cabinet.

Cabinet Drawer. An aluminum pullout drawer hinged at the top and having sliding tracts shall be provided in the cabinet. The drawer shall have the approximate dimensions of 45mm in height, 330mm deep and 405mm wide and be capable of holding 18kg in weight when the drawer is extended. Provide a top for the storage compartment that has a non-slip plastic laminate attached, which covers a minimum of 90% of the surface area of the top.

Door Alarm. A door ajar alarm switch shall be installed on front and back doors. Each switch shall be of heavy duty, spring-loaded design with single pole normally closed contacts. Each switch circuit shall be closed whenever the corresponding door is open at an angle of 15 degrees or more. The switches shall be installed so that they will not restrict removal of the cabinet rack assembly in any way. The door ajar switches shall only be used to support the door ajar alarm function; they shall not be used to support any other function (such as cabinet illumination or conflict monitor interlocking).

Each switch shall be wired to 2-point barrier style terminal block on the input side of the cabinet. One point of the terminal block shall also be connected to pin C1-75 of the controller's C1 connector. The other point of the terminal strip shall be connected to controller logic ground.
Input File Slot 14. Input File Slot 14 shall be disabled by means of jumping Channel 1 Out (F) to Channel 1 In (D), and Channel 2 In (W) to Channel 2 Out (J). The front opening of Input File Slot 14 shall be covered with a faceplate constructed of the same material as the input file housing.

Cabinet Filters. The cabinets shall have vents on both the front and back doors and metal water deflection panels mounted inside the vents. A disposable paper filter element shall be provided in lieu of a metal filter.

Surge Protection. The cabinet shall be furnished with a plug-in RFI filter and surge protection device, EDCO MODEL SHA 1250, mounted on the cabinet service panel assembly on Socket BEAU S-5412 SB or approved equal.

Conflict Monitor. The conflict monitor shall meet the requirements of the CalTrans specifications, plus the additional requirements as specified below:

The conflict monitor shall provide a guaranteed minimum flash time on power-up, brownout restore, and short AC Line interrupts to allow the 2070L controller time to boot and set signal outputs.

The conflict monitor shall provide red monitoring and the Model 336S Cabinet shall be adapted for red signal monitoring. All required cables, wiring and equipment for red signal monitoring shall be included under this item.

The conflict monitor display on the front panel shall clearly indicate the following tripped conditions: 24VDC Fail, Conflict, Watchdog Error, Switch or Dual Indication, Red Fail, and Yellow or Sequence Fail.

The conflict monitor shall have a 10/100 Mbps Ethernet port installed on the front panel for communicating with a laptop computer, or for communications through the switch provided under this item. The software for communicating with the conflict monitor shall be provided.

The conflict monitor shall be capable of storing in non-volatile memory a minimum of 100 events. Each event shall be marked with the time and date of the event. These events consist of fault events, AC Line events, reset events, and configuration change events.

Model 200 Solid State Switchpack. The Model 200 Solid State Switchpack shall conform to the requirements in CalTrans documents TSCES and TEES, and to all addenda thereto current on the issue date of this invitation.

Model 204 Flasher Unit. The Model 204 Flasher Unit shall conform to the requirements in CalTrans documents TSCES and TEES, and to all addenda thereto current on the issue date of this invitation.

Model 222 Dual Channel Loop Vehicle Detector. The Model 222 Dual Channel Loop Vehicle Detector shall conform to the requirements in CalTrans documents TSCES and TEES, and to all addenda thereto current on the issue date of this invitation.
Model 242 Dual DC Isolation Module. The Model 242 Dual DC Isolation Module shall conform to the requirements in CalTrans documents TSCES and TEES, and to all addenda thereto current on the issue date of this invitation.

Model 430 Flash Transfer Relays. The Model 430 Flash Transfer Relays shall conform to the requirements in CalTrans documents TSCES and TEES, and to all addenda thereto current on the issue date of this invitation.

6-Port Ethernet Switch. The Contractor shall furnish and install a 6-Port Ethernet Switch to connect to field devices with Ethernet communications. The Ethernet switches shall be installed in the Type 336S/332 cabinets as designated on the plans or as directed by the Engineer.

Operating System.
Plug and Play. Automatic learning, negotiation, and crossover detection.
Port Rate Limiting and Broadcast Storm Limiting
Port Configuration, Status, Statistics, Mirroring and Security
Loss of Link Management on Fiber Ports

IEEE Compliance.
802.3-10BaseT
802.3u-100BaseTX
802.3d-MAC Bridges
802.1d-Spanning Tree Protocol
802.1p-Class of Service
802.1q-VLAN Tagging
802.1w-Rapid Spanning Tree Protocol

Ethernet Ports.
(6) 10/100BaseTX, Minimum

Switch Properties.
Store and Forward Switching Method
5us (100Mbps) Switching Latency
1.6Gbps Switching Bandwidth
8192 MAC Addresses
2 Priority Queues
160 Packet Buffers (1536 each) Frame Buffer Memory
1000 Vlans
256 IGMP Multicast Groups

*Network Mgmt.*
Web Based Graphical HTML
SNMP v1, v2c
Telnet, VT100
Command Line Interface (CLI)

*Indicators.*
Per Port - Link and Activity LEDS
Power - Power status indicator

*EMI Immunity and Environmental.*
IEC Compliance 61000-6-2 Industrial
61800-3 Industrial
61850-3 Electric Utility Substations
IEEE Compliance 1613 Electric Utility Substations
NEMA Compliance TS-2 Traffic Control Equipment
Temperature -40°C to + 85°C (No Fan)
Humidity 0 to 95% non-condensing

*Electrical Requirements.*
Voltage – 115/120 VAC. An adapter may be used to provide the required power.
Power Consumption - 20W max.
Protection - Resettable circuit breakers or fuses shall be provided to protect the equipment. The protection may be provided either as part of the cabinet wiring or on the equipment. All equipment shall be hot swappable.

*Mechanical.*
Dimensions – 40mm (Height) x 200mm (Width) x 250mm (Depth), Maximum
Mounting - Shall be suitable for mounting on a shelf or attached to a wall of the cabinet.

*Mounting.*
**Base Mount.** When base mounted, the Model 336S Cabinet shall be mounted on a foundation with an “M” base adapter as prescribed by the plans or item sheet. The Contractor shall supply
all bolts, nuts, lockwashers, mounting plates, and other material required to secure the cabinet properly to the “M” Base Adapter and foundation in accordance with the Traffic Signal Standard Drawings.

**Pole Mount.** When pole mounted, the Model 336S Cabinet shall be mounted on a pole as prescribed by the plans or item sheet. Pole mounted cabinets shall be furnished with two (2) exterior pole mounting brackets and an aluminum plate to cover the opening on the bottom of the cabinet. The manufacturer shall reinforce the cabinet sidewalls bracket mounting holes with metal plates of adequate size and strength, welded longitudinally across the inside depth of the cabinet. The cabinet shall provide sufficient resistance to flexing and shall withstand pole mounting without warping the cabinet when doors are opened or closed.

**Installation.** The installation shall include the drilling of posts or poles and the fastening of supports. The Contractor shall supply all bolts, nuts, straps, condulets, nipples, lockwashers, mounting plates, and other material required to secure the cabinet properly to the pole in accordance with the Traffic Signal Standard Drawings. The condulet shall be 100mm in diameter.

The Contractor shall make all field cable connections in the cabinet with approved insulated solderless lugs. All cabinet wiring shall be neat and firm.

The controller and cabinet assembly with auxiliary equipment shall be tested in the field with the prescribed timing schedules for forty-eight (48) trouble-free hours prior to on-line activation.

**CONSTRUCTION DETAILS**

The Contractor shall install the Model 336S Cabinets at locations specified on the plans.

After all cables are installed and tested entering the cabinet, the Contractor shall seal all conduits using an approved sealing foam and steel wool to deter rodent entry in the cabinet. Payment for this work shall be covered in the applicable conduit item. No separate payment shall be made for this work.

The cabinet doors shall be perpendicular and open away from the curb as specified on the plans. If the plans do not indicate this information, the Contractor shall confirm with the Engineer regarding the orientation of the cabinet.

All wiring connected to terminal blocks, flashers, relays, switches, radio interference suppressor, etc. shall be identified by use of insulated pre-printed tags over the wire including, but not limited to, signal control wires, loop detector lead-in, etc. The wire markers shall carry the legend in plain words with sufficient details so that a translating sheet will not be required.

Cabinets shall be wired to accept and implement all of the features of the specified equipment.

**Documentation Requirements.** One (1) complete set of operation and maintenance manuals shall be placed in each field cabinet and ten (10) complete sets shall be delivered to the Engineer. The manuals shall, as a minimum, include the following:

1. Complete cabinet and equipment layout drawings for all cabinet mounting configurations.
2. Complete cabinet wiring and harness drawings.
3. Complete installation procedures.
4. Complete parts list including names of vendors for parts not identified by universal part numbers such as JEDEC, RETMA, or EIA.
5. Pictorial of components layout on circuit board.
6. Complete maintenance and trouble-shooting procedures.
7. Complete stage-by-stage explanation of circuit theory and operation.

The cabinet wiring diagram provided by the manufacturer shall reflect the C1 wiring/pin assignment in accordance with the C1 pin/assignment of the firmware furnished and installed under this contract.

The cabinet/equipment layout and cabinet wiring diagram shall be submitted for review and approval prior to actual cabinet fabrication.

**Testing Requirements.** Test procedures shall be submitted for approval prior to testing. At a minimum the following cabinet tests shall be performed on all cabinets, with a designated representative from the Town of Huntington and the Engineer present:

1. 48 hour hot and cold for cabinet and controller - documented and certified.
2. Run STEP (Self Test Evaluation Program) on controller - documented and certified.
3. Run 336 Cabinet test on cabinet. - Documented and certified. It should test the following:
   a. Input file wiring
   b. Output file wiring
   c. Timing of all possible conflict combinations
   d. Watchdog error
4. Test proper brownout voltage calibration between conflict monitor and controller. Manufacturer to submit procedure for approval. Documentation and certification to be shipped with cabinet.
5. Perform conflict monitor unit (CMU) testing as follows:
   a. Test all channel to channel conflicts
   b. Test all voltage threshold levels
   c. Test all auxiliary functions (watchdog, 24 VDC, program card ajar, etc.)
   d. Test all enhanced (absence of red, sequence, etc.)
   e. A printed record of each test to be provided; in particular all threshold voltages shall be documented.

**METHOD OF MEASUREMENT**
This work will be measured as the number of Model 336S Cabinets satisfactorily furnished and installed and made fully operational and tested.

**BASIS OF PAYMENT**
The unit price bid to furnish and install a Model 336S Cabinet shall include the cost of furnishing all labor, materials, tools and equipment necessary to complete the work in accordance with the Contract Documents. Payment for all documentation and testing specified herein shall be included under this contract item.