

# City of Oceanside



## TRAFFIC SIGNAL DESIGN AND POLICY MANUAL

MAY 2021



## **FORWARD**

This manual establishes uniform policies and procedures for the preparation of traffic signal plans in the City of Oceanside.

It is not intended as a textbook or a substitute for engineering knowledge, experience, or judgement, but rather as a guideline to uniformity and to provide the designer with sufficient information to prepare the desired plans with a minimum of uncertainty.

Traffic signals installed in the City's redevelopment area and in the Rancho Del Oro area may have special design specifications. Engineer should check with the Public Works Department, Transportation Division before starting project.

Deviations from these specifications shall be requested from the City Traffic Engineer for approval prior to commencement of work.

# Table of Contents

<b>GENERAL REQUIREMENTS .....</b>	<b>1</b>
<b>PLAN FORMAT AND DRAFTING REQUIREMENTS .....</b>	<b>1</b>
<b>BID DOCUMENT REQUIREMENTS.....</b>	<b>2</b>
<b>TRAFFIC SIGNAL DETAILS .....</b>	<b>3</b>
<b>1.0 - SPECIAL PROVISIONS, INSTALLATIONS, AND EQUIPMENT REQUIRMENTS .....</b>	<b>3</b>
<b>1.1 - POLES AND MAST ARMS .....</b>	<b>3</b>
1.1.1 - Poles .....	3
1.1.2 - Mast Arms .....	4
<b>1.2 - PULL BOXES .....</b>	<b>4</b>
<b>1.3 - CONDUIT .....</b>	<b>4</b>
<b>1.4 - CONDUCTORS AND WIRING .....</b>	<b>5</b>
<b>1.5 - DETECTION .....</b>	<b>5</b>
1.5.1 - Bicycle Detection.....	6
1.5.2 - Loop Detection Installation.....	6
1.5.3 - Video Detection Installation .....	6
<b>1.6 - CABINET AND EQUIPMENT .....</b>	<b>6</b>
1.6.1 - Conflict Monitor .....	6
1.6.2 – Controller .....	7
1.6.3 - Controller Cabinet .....	7
<b>1.7 - SERVICE AND ELECTRIC SERVICE CABINET .....</b>	<b>8</b>
<b>1.8 - BATTERY BACK-UP SYSTEM .....</b>	<b>9</b>
<b>1.9 - SIGNAL INDICATION HARDWARE FINISH SPECIFICATIONS.....</b>	<b>10</b>
<b>1.10 - FOUNDATIONS .....</b>	<b>10</b>
<b>1.11 GROUNDING AND BONDING.....</b>	<b>10</b>
<b>1.12 - REFLECTORIZED STREET NAME SIGNS .....</b>	<b>10</b>
<b>1.13 - EMERGENCY VEHICILE PREEMPTION .....</b>	<b>11</b>
<b>1.14 - SIGNAL HEADS.....</b>	<b>11</b>
1.14.1 – Vehicular Signal Heads.....	11
1.14.2 - Pedestrian Signal Heads.....	12
<b>1.15 - PEDESTRIAN PUSH BUTTON ASSEMBLY .....</b>	<b>12</b>
<b>1.16 - LED BLANKOUT SIGN .....</b>	<b>13</b>
<b>1.17 - SPEED RADAR SIGNS .....</b>	<b>13</b>
<b>1.18 - SAFETY LIGHTING STANDARDS .....</b>	<b>13</b>
<b>1.19 - SALVAGED EQUIPEMENT .....</b>	<b>13</b>
<b>2.0 - TRAFFIC SIGNAL COMMUNICATION CABLE .....</b>	<b>13</b>
<b>2.1 - CONDUIT .....</b>	<b>13</b>
<b>2.2 - INTERCONNECT PULL BOXES AND VAULTS.....</b>	<b>14</b>

<b>2.3 - TRACER WIRE .....</b>	<b>14</b>
<b>2.4 – CABLE .....</b>	<b>14</b>
<b>2.5 - FIBER OPTIC INTERCONNECT EQUIPMENT .....</b>	<b>15</b>
<b>2.6 - COMMUNICATION DATA NETWORK .....</b>	<b>15</b>
<b>2.7 - ETHERNET SWITCHES.....</b>	<b>16</b>
<b>2.8 - BROADBAND WIRELESS ETHERNET COMMUNICATION.....</b>	<b>16</b>
<b>2.9 - CCTV VIDEO NETWORK .....</b>	<b>17</b>
<b>2.10 - TESTING .....</b>	<b>18</b>
<b>3.0 - TRAFFIC SIGNAL GENERAL NOTES.....</b>	<b>19</b>
<b>EXHIBIT: GENERAL LOOP DETECTION ASSIGNMENT .....</b>	<b>21</b>

## GENERAL REQUIREMENTS

The Engineer preparing traffic signals shall:

- A. Utilize latest Caltrans Standard Plans and Specifications.
- B. Utilize latest Caltrans Standard Special Provisions.
- C. Utilize latest Caltrans standards and California Manual on Uniform Traffic Control Devices (CA MUTCD) recommended design practices, where applicable.
- D. Include Oceanside's special requirements, as defined in this manual.
- E. The order of precedents (in cases of omissions and/or discrepancies) in the manuals, will be City of Oceanside Traffic Signal Design and Policy Manual, CA MUTCD, Caltrans Standard Plans and Specifications, and then The "Greenbook".
- F. Pothole locations of the proposed mast arm poles and/or 1A poles prior to completion of the plans (if conflicts are foreseen).
- G. Utilize City of Oceanside standard plan sheets and title sheets.
- H. Meet with City Transportation Division to review design concepts. Engineer shall prepare a concept drawing for discussion.
- I. Coordinate with the serving utility for service points and conflicts.
- J. Send plans to all utility companies for their review and input.
- K. Provide three sets of plans for each submittal.
- L. Plans shall be signed by a registered Civil Engineer in California.
- M. A walk-through with the City shall take place prior to design.

## PLAN FORMAT AND DRAFTING REQUIREMENTS

The City requires all final traffic signal plans be prepared on mylar. The quality of drafting and lettering size shall be able to produce clear, concise, and legible reproductions in order to insure legible reduced prints. Plans shall be produced in AutoCAD. A copy of the electronic file of the signed drawings shall be submitted to the City, along with the pen table used to plot the drawing. Files shall be provided in both .PDF and .DWG formats.

Plan preparation shall conform to and/or include the following requirements:

- A. Traffic signal phasing shall conform to NEMA standards ("Phase" =  $\phi$ )
  - a. When preparing plans for crossing streets, the major street shall be Phase 2 and 6. If the streets are apparently of equal importance, the City Transportation Division shall designate the major street.
  - b.  $\phi 2 + \phi 6 =$  major street
    - i.  $\phi 2 =$  Eastbound on E-W street or
    - ii.  $\phi 2 =$  Northbound on N-S street
- B. North shall always be oriented up or to the right on all plans. The major arterial shall always be horizontal on the plan.
- C. Signal plans shall be drawn at a 1" = 20' scale. Signing and striping plans shall be drawn at 1" = 40' scale.
- D. Signing and striping modifications shall be provided on separate plan sheets, and refer to California Standard Plans and CA MUTCD for traffic signing and striping.

- E. Letters shall be used to identify poles and shall always go in alphabetic order clockwise around the intersection with the "A" pole always being on the controller corner.
- F. Conduit run identification numbering shall start at the conduit for the service pedestal and increase clockwise at the intersection. The final home run shall include 3-3" conduits.
- G. Pedestrian ramps shall meet ADA requirements and City standards.
- H. Provide ADA curb ramps and truncated domes at every corner where a pedestrian crossing is present.
- I. The traffic signal plan shall contain, at a minimum, the following: conductor schedule, pole schedule, phase diagram and construction notes.
- J. It might be required to enlarge detailed area(s) on the plans and/or have a separate sheet for details plans and/or notes to allow for clarification.

Any deviation from the various formats shown on the typical plan shall be approved by the City staff prior to preparation of the plans.

#### **BID DOCUMENT REQUIREMENTS**

- A. City Standards, Caltrans Standard Specifications, and Caltrans Standard Plans shall be referred to as part of the contract requirements. Caltrans current Standard Special Provisions shall be utilized as the base for contract preparation.
- B. In addition to the required, applicable, Caltrans Special Provisions, the following City special provisions shall be included, where applicable:
  1. Contractor shall maintain existing and temporary electrical systems. When traffic signal systems are de-energized, they shall be limited to periods between the hours of 9:00 AM to 3:00 PM, Monday through Friday, or otherwise approved by Traffic Engineering and/or City Inspector.
  2. The contractor shall notify the City of Oceanside's Public Works Department: Transportation Engineer Division and Electrical Department, through the City Inspector, a minimum of forty-eight (48) hours prior to de-energizing any traffic signal system. The City will contact OPD Dispatch.
  3. The contractor shall notify the City of Oceanside's Public Works Department, Transportation Division, and Electrical Department, through the City Inspector, a minimum of forty-eight (48) hours before requiring access to any City cabinet for any work required.
  4. Planned power outages scheduled by construction projects require fourteen (14) day notice to the City of Oceanside's Public Works Department to review for manpower needs and costs.
  5. Contractor shall place "Stop Ahead" and "Stop" signs for all intersection approaches to direct vehicle traffic through the intersection during traffic signal system shutdown, or during planned power outages. Temporary "Stop Ahead" and "Stop" signs shall be either covered or removed when the system is turned on.
  6. "Stop Ahead" and "Stop" signs are required during testing of new traffic signal installation and contractor is required to make sure striping has been established (especially at stop bars/limit lines).
  7. Night work will be scheduled when required by the City. When night work is required by the City, the contractor shall be required to provide adequate temporary lighting to accommodate the needs of both the pedestrian and vehicular traffic. Typical night

work hours are 9:00 PM to 5:00 AM Monday through Friday, or otherwise approved by Traffic Engineering and/or City Inspector. City Noise Ordinance will be enforced.

8. Contractor will be required to pay costs of overtime or extra personnel for controlling traffic at dark intersections.
9. The contractor shall have a representative from the controller manufacturer, and all other representative's necessary to support the signal present at the signal turn-on.
10. The initial signal turn-on shall be between 9:00 AM and 2:00 PM, Monday to Thursday, unless specified otherwise in writing by a Transportation Engineer, and Traffic Engineering shall be given a minimum of a week notice when the signal is scheduled to be energized.
11. A complete set of "As-Built" plans or record drawings shall be delivered to the Transportation Engineering Division upon completion of work, including electronic file for "As-Built" plans or record drawings.
12. All material lists, manufacturers' warranties, guarantees, brochures and manuals shall be submitted in a bound binder prior to acceptance of project.
13. The contractor shall deliver the controller and the cabinet to the City of Oceanside City Operation Center (4927 Oceanside Boulevard) two weeks prior to installation.
14. The contractor shall be responsible for all hardware installed. Warranty starts once as built plans are accepted and approved by the City. The contractor is responsible to address any equipment/hardware issues that occur up to and through warranty time period.

## **TRAFFIC SIGNAL DETAILS**

### **1.0 - SPECIAL PROVISIONS, INSTALLATIONS, AND EQUIPMENT REQUIREMENTS**

The following sections provide further information about special requirements of the City of Oceanside. Traffic signals installed in the City's redevelopment area and other areas may have special design specifications. Engineer should check with the Public Works Department, Transportation Division before starting project.

#### **1.1 - POLES AND MAST ARMS**

##### **1.1.1 - Poles**

- a) Standards shall be placed on opposite sides of the pedestrian ramp (see ES-4C of the latest edition of the State of California Standard Plans for the typical location of signal standard placement). All traffic signal plans shall indicate required traffic signal pole locations as referenced from BCR, ECR, and curb face.
- b) All Poles must meet the wind load and all other specifications in the latest revision of the State of California Standard Plans.
- c) No poles or pull boxes are allowed within the limits of pedestrian ramps including the ramp slopes.
- d) Pole anchor bolts shall meet Caltrans Standards and Specifications.
- e) Where modifications will leave holes in existing poles, the holes shall be repaired pursuant to State of California Standard Specifications or City approved repair method.

### **1.1.2 - Mast Arms**

- a) Mast arms shall be provided for all approaches unless otherwise approved by the City staff.
- b) All traffic signal mast arms shall present a uniform and level appearance when complete.
- c) For intersections with protected left-turn phasing, the mast arm shall be long enough to align the left-turn signal head as close as possible to the center of the left-turn lane where there is one left-turn lane, or to the lane line between the left-turn lanes if there are two left-turn lanes.
- d) Approved bird spikes (as noted during the pre-design job walk) shall be installed when directed by the City Traffic Engineer.

### **1.2 - PULL BOXES**

- 1) All pull boxes (box, extension) shall be "Christy Brand" with lid(s) being "Fiberlyte Brand" and size No. 5, unless otherwise noted on the plans. Pull box covers shall be stamped "Traffic Signal".
- 2) All pull boxes shall conform to the latest State of California Standard Plans and Specifications.
- 3) Pull boxes adjacent to the Controller Cabinet shall be M48 with two piece cover unless otherwise directed.
- 4) Pull boxes shall not be placed: In raised or painted medians, in paved shoulder, in traveled way, in driveways, within three feet of a sidewalk access ramp or flares (unless approved by City staff).
- 5) When retrofitting pedestrian ramps and relocating existing boxes, existing pull boxes must be replaced with traffic rated models and non-skid steel lids as determined by City staff.
- 6) If lowering pull boxes, must lower conduit to provide 4-inch clearance.
- 7) Pull boxes placed in dirt shall utilize markers for easy location of pull box.
- 8) Pull boxes shall be spaced at intervals of 200 feet or less.
- 9) Electrical power pull box shall be placed no more than 5 feet from the service cabinet.
- 10) Pull boxes shall be installed per manufacturer's installation guidelines, including field preparation and backfilling.

### **1.3 - CONDUIT**

- 1) All traffic signal conduit street crossings or any conduit located within the roadway travelled (including driveways) shall be schedule 40 rigid PVC. Exceptions to this requirement shall be determined by City staff.
- 2) All crossing and communication conduits shall be two-inch (2") minimum. All legs of the intersection shall have a conduit crossing installed (one spare with mule tape). All conduits shall contain mule tape per State of California Standard Specification and a No. 8 stranded insulated green trace wire.
- 3) Conduit fill shall not exceed the NEC maximum of 40% for conduits with three or more conductors. For traffic signal modifications, max percent conduit fill shall be approved by City staff.
- 4) Install quantity three, three-inch, and quantity one, two-inch conduits from controller cabinet base to the adjacent home run pull box. Install signal cable in the first conduit, and interconnect conductors in the second and the balance of conductors in the third 3" conduit. Service conductors shall be installed in the 2" conduit alone unless otherwise approved by City staff.
- 5) All conduits entering pull boxes, vaults and cabinets shall be protected with duct seal. No open holes are allowed. The ends of all conduits shall have approved bell fittings.

- 6) Install conduit to a depth of not less than 30 inches below finished grade (unless otherwise approved by the City), except in sidewalk areas, where it must be at least a minimum of 18 inches below grade.

#### **1.4 - CONDUCTORS AND WIRING**

- 1) Traffic signal cable shall be #14 gauge/3-conductor, #14 gauge/5-conductor, #14 gauge/9-conductor, #14 gauge/12-conductor or approved other per the latest Caltrans-Standard Specification, and be a continuous run from the signal cabinet to the terminal block it services. No splicing of signal cable shall be permitted unless otherwise directed or approved by City staff.
- 2) The signal cables shall be labeled (permanently affixed printed labels) in each pull box per the latest State of California Standard Specifications and at the signal cabinet, indicating the cable/wire type and signal standard to which it is connected. Labels are required for loops, signal conductors, SIC, fiber, and any other conductors within cabinet and pull box.
- 3) All traffic signal field conductors shall have a 3-foot coil of extra wire in each pull box to allow for servicing. The signal conductors shall be organized in a bundle to allow for easy identification of wires and cables.
- 4) Multi conductor video cable shall meet vendor specifications.
- 5) Loop detector lead-in cable shall be Type B Caltrans Standard 16 AWG, unless otherwise approved by City staff.
- 6) Loop detector wire shall be Type 2. All lead-in DLCs shall be labeled in the cabinet with lane number and phase assignment.
- 7) Conductors for Safety Lighting (SL) shall be No. 10 unless otherwise noted on the plans. The conductors shall be per the latest NEC standards.
- 8) The Safety Light conductors may be spliced to branch the Safety Light circuit as it progresses around the intersection.
- 9) Fuses and fuse holders shall be installed in the pole hand hole for each luminaire. See City of Oceanside's Street Light Design Policy Manual for fuse and fuse holder specifications.
- 10) All field installed wiring shall be Megger-Ohm tested. The CONTRACTOR shall provide documentation showing results that the wiring has passed the test.

#### **1.5 - DETECTION**

- 1) Loop detection is required on all streets and approaches and shall not be substituted unless special conditions exist that preclude the installation of in-pavement detection or at the discretion of City staff. Special conditions may include private driveways, decorative concrete, or bridge decks.
- 2) All loops shall have a separate DLC to the controller cabinet. All lanes shall have separate DLCs. See Exhibit A.
- 3) Loop detection shall be installed on all limit line, advance detection, left turn lanes, and bike lanes. Loops shall be circular Type E (6' diameter). Limit line detectors shall be Modified Type E loops (for bike detection). Loops shall be installed flush with the limit line. See Exhibit A.
- 4) All bicycle lane detector loops shall be Type Q.
- 5) Advance detection is required on all approaches. Install a single loop per lane with one individual DLC for all loops. Setbacks from the limit line shall be per CA MUTCD. See Exhibit A.
- 6) If a minor street approach has advance detection, install two loops per lane spaced 10 feet apart starting at the crosswalk or limit line.
- 7) Install four loops spaced 10 feet apart in advance of the crosswalk or limit line in left-turn lanes.

- 8) Minor street right-turn only lanes will have 2 loops spaced 10 feet apart. Provide separate DLC to controller cabinet.
- 9) On a minor street, if there is no right-turn only lane, install one loop at the limit line, adjacent to the curb for right turn traffic.
- 10) All detection cables and cards shall be labeled in the cabinet with lane number and phase assignment.
- 11) Detector cards shall be EDI Oracle 2EC. Four (4) channel sensor units shall not be used.

#### **1.5.1 - Bicycle Detection**

- a) If the approach has a bike lane, install a six-foot-long Type Q loop, 44 feet in advance of crosswalk and at the limit line in the bike lane (or where the bike lane drop transition occurs if further back).
- b) Width of Type Q loop varies: 6" to 12" inside bike lane line and 6" to 12" outside gutter or other channelization line, providing a 3-foot wide to 4-foot wide loop.
- c) All new traffic signals or any signal modification exceeding \$50,000 in cost, shall have bicycle detection for all approaches, unless approved otherwise by City Traffic Engineer.

#### **1.5.2 - Loop Detection Installation**

- a) Loop detectors in asphalt or concrete shall use rubberized hot melt type sealant.
- b) Loop detector splices shall be soldered and sealed with heat-shrink containing waterproof sealant.
- c) The number of sensor units and lead-in cables required to achieve the specified detection shall be installed. This is based off number of loop detections installed to accommodate the design and traffic phases.

#### **1.5.3 - Video Detection Installation**

When special conditions exist that preclude the installation of in-pavement detection, or if the City chooses not to install loop detectors, video detection shall be used. Video detection system shall be Iteris Vantage Edge 2 with EdgeConnect Card, or City approved equal. The video detection system shall be approved by City staff. All installation shall include necessary components to run the system including but not limited to: video processor(s), flat panel monitor with a door hangar bracket (10.4" TFT LCD video monitor or City approved equal), Ethernet communication module, and color camera(s).

### **1.6 - CABINET AND EQUIPMENT**

#### **1.6.1 - Conflict Monitor**

The conflict monitor shall meet all the requirements of the latest edition of the Caltrans Standard Specifications and shall also meet the following specifications:

- a) The conflict monitor shall be a model 2010ECLip by EDI (or City-approved equivalent).
- b) The base design shall be tested by an independent lab for transient and environmental requirements.
- c) The conflict monitor shall have 16 channel capability with a 10/100 Ethernet port.

- d) A portable laptop computer shall not be required to program or verify monitor setting (only used for log events).
- e) The conflict monitor shall be capable of monitoring 5 section heads.
- f) The conflict monitor shall display active colors independently during operation.
- g) The conflict monitor shall display active colors independently at time of fault.

**1.6.2 – Controller**

- a) The City allows only Intelight 2070 LX ATC controllers to be installed, or approved equal.
- b) The Controller shall conform to Caltrans "Transportation Electrical Equipment Specifications (TEES)" (latest edition) and be on the latest Caltrans qualified products list.
- c) The controller unit shall be a 2070 ATC.
- d) The Intelight 2070 LX ATC controller shall be delivered pre-loaded with the latest approved Maxtime controller firmware.
- e) The CONTRACTOR shall furnish two (2) maintenance and operation manuals for all new controller units, auxiliary equipment, vehicle detector sensor units, ITS and communication equipment, and interactive plug-ins to the City's Maintenance Division. The operation and maintenance manuals shall be submitted upon equipment delivery. The O&M manuals shall include, but need not be limited to, the following items:

- i. Specifications.
- ii. Design characteristics.
- iii. General operation theory.
- iv. Function of all controls.
- v. Troubleshooting procedure (diagnostic routine).
- vi. Block circuit diagram.
- vii. Geographical layout of components.
- viii. Schematic diagrams.
- ix. List of replaceable component parts with stock numbers.
- x. As-built drawings.
- xi. Detector assignment table.

**1.6.3 - Controller Cabinet**

The controller cabinet shall be model 332, 333L, or approved type with a natural aluminum finish and include front and back door switches per the latest edition of the Caltrans Standard Specifications and Caltrans "Transportation Electrical Equipment Specifications (TEES)" (latest edition).

- a) The cabinets shall be on the approach-side corner of the minor arterial. Where sufficient right of way exists, a minimum of 48-inches of concrete sidewalk and clearance shall be provided at the front and rear of the cabinet(s) and a minimum of 36- inches of sidewalk and clearance on the sides of the cabinet(s). Unless otherwise noted on the plans, clearances shall be unobstructed by any above ground facilities. City staff must approve any variance from the preferred location.

- b) The front side of traffic signal controller cabinet shall be oriented such that the technician faces the intersection when viewing the controller front panel and the front door handle should be on the right and the door shall open toward the street.
- c) The controller cabinet shall be equipped with (2) interior LED lights, to be mounted on the front and rear of the cabinet, on the EIA rails.
- d) The controller cabinet shall have a dual fan panel installed.
- e) The controller cabinet shall have a detector actuation panel installed. Panel shall be mounted to the EIA rail. It shall have (18) on – off – momentary switches installed. The switches shall be wired to Phases 1-8 inputs, 2,4,6,and 8 ped inputs, EVA, EVB, EVC, and EVD inputs, RR1, and RR2 inputs.
- f) The controller cabinet shall be caulked at the bottom with a clear type sealant.
- g) The controller cabinet shall be wired for red monitoring.
- h) The controller cabinet shall be wired for door alarm monitoring of both front and rear doors.
- i) The controller cabinet shall be wired for all phases that are shown on signal plan.
- j) The controller cabinet shall include (20) EDI Oracle 2EC vehicle loop detector cards.
- k) The controller cabinet shall include (12) 200 load switches.
- l) The controller cabinet shall include an integral rack mounted document drawer assembly for the purpose of document storage and writing surface. The document drawer shall have an interior depth of approximately 1.5 inches, have drawer guides made of aluminum, have drawer mounting brackets made of stainless steel, and have a hinged lift top writing area.
- m) The controller cabinet output files shall be equipped with UL rated multi-conductor terminal lug.
- n) Wire and/or cable shall not wrapped around obstructions in the bottom of the cabinet. All wires/cables shall be in a loose coil in the bottom.
- o) The controller cabinet shall include an "AS-BUILT" blueprint of the signal and timing plan inside the cabinet.
  - i. If the controller cabinet design deviates in any way from the details in this manual, such deviation shall be submitted to City staff or their assigned representative for review before fabrication of the contract cabinets. If deemed necessary one complete prototype cabinet shall be delivered to him for review at least 30 days before fabrication of the contract fixtures. The prototype cabinet will be returned to the CONTRACTOR and if permitted by City staff or their assigned representative, the cabinet may be installed. Lack of compliance with the requirement will require the replacement of non-compliant cabinet at the contractor's expense.

## **1.7 - SERVICE AND ELECTRIC SERVICE CABINET**

Caltrans special provisions are amended to read:

Except for false work lighting, the CONTRACTOR shall be responsible for applying for and arranging with the serving utility to complete service connections for both temporary and permanent installations and the CONTRACTOR shall pay all costs and fees required by the utility.

The City will provide the SDGE service address for the meters.

The electrical service cabinet shall:

- 1) Be fabricated with an anodized aluminum finish.
- 2) Provide Type III-C single meter electrical service for all new signal installation.
  - a. Dual meter electrical service may be required as necessary, and noted on the plans.
  - b. Deviations shall be approved by City staff.
- 3) Meet the SDGE Service Guide service requirements and the latest Caltrans Standard Plan Drawings and specifications.
- 4) Have separate main disconnect circuit breakers for metered and unmetered sections.
- 5) Have plug-in type circuit breakers. Cable bussing is not allowed. (50 amp SP breaker for signals and 30 amp SP for safety lighting.)
- 6) Be caulked at the bottom with a clear type sealant.
- 7) Be a model, part, class, or type number as approved by City staff.
- 8) Service shall have an Arc flash rating.

### **1.8 - BATTERY BACK-UP SYSTEM**

Battery back-up system may be required at City Traffic Engineer's discretion. This will be discussed during the pre-design job walk. If required, the battery back-up system (BBS) cabinet shall conform to the following items:

- 1) Be housed in the Traffic Signal Control Cabinet, or attached side mount cabinet. Contact the City Traffic Engineer for the latest specifications for the cabinets. Stand-alone cabinet may be requested by City for special circumstances.
- 2) The BBS cabinet shall contain a thermostatically controlled cooling fan.
- 3) The battery back-up system shall be an Alpha FXM1100 or approved equal, and must be approved by the City Traffic Engineer.
- 4) The BBS must contain an Ethernet/IP communication module wired for communication to the TMC.
- 5) The BBS shall provide alarm contact closure outputs on initial loss of power, timer, and user definable percentage of battery life remaining.
- 6) Install a 2 pair communication cable between the BBS, and the 332 cabinet and wired up to provide an alarm when batteries are in service.
  - a. The BBS shall be wired into an external alarm input of the controller to provide alarm upon initial loss of power.
  - b. The BBS shall be wired into the Railroad 1 input to provide flashing operation upon 40% battery life remaining.
- 7) The BBS shall have a manual bypass switch with automatic transfer.
- 8) The BBS cabinet shall have an auxiliary generator plug installed, with a lockable cover and include any necessary generator kits.

## **1.9 - SIGNAL INDICATION HARDWARE FINISH SPECIFICATIONS**

Framework parts shall have a powder coated finish and be a City approved process. The minimum requirements are as follows:

- 1) All framework parts shall be flat black per the latest Caltrans specifications.
- 2) A 3-5 stage pretreatment consisting of: Degrease, Rinse, Iron Phosphate, Rinse, and, Seal. Note: Degrease and Iron Phosphate can be combined, thereby eliminating Rinse, making this a 3-stage process.
- 3) A dry off cycle for at least 10 minutes at 300° to 400° F.
- 4) Electrostatically applied powder at 75-90KV.
- 5) Thermal setting cycle for 20 minutes at 400° F.
- 6) All parts shall be coated with an ultraviolet resistant polyester powder. The only exception is for items of flat black, which can be coated with a self-cleaning flat black epoxy.
- 7) All threaded fitting hardware to be assembled with anti-seize compound.
- 8) All terminal boxes are to be made of bronze.

The CONTRACTOR shall furnish manufacturer's certificate of compliance with City approved powder coating process prior to installation of equipment.

## **1.10 - FOUNDATIONS**

Portland cement concrete shall conform to the latest edition of Caltrans Standard Specifications and Greenbook, and shall contain not less than 470 pounds of cement per cubic yard. Foundation shall be installed per the latest version of Caltrans Standard specifications and Greenbook.

## **1.11 GROUNDING AND BONDING**

- 1) The grounding jumper shall be installed per Caltrans specification in the signal standard and shall be run to the conduit, ground rod, or bonding wire in the adjacent pull box.
- 2) A ground rod shall be required at every corner unless specified otherwise on signal plans.
- 3) Equipment grounding conductor #8 AWG is required in all conduit.
- 4) All grounding wires shall be continuously bonded and connected back to the cabinet ground buss bar.
- 5) All grounding splices shall be insulated per Caltrans specifications. Unless otherwise approved by City staff.

## **1.12 - REFLECTORIZED STREET NAME SIGNS**

Single face street name signs shall be per City of Oceanside specifications and include the following items:

- 1) Street name signs shall be single sided.
- 2) Street name signs shall be made with 3M Diamond Grade material reflective sheeting.
- 3) Street name signs shall have Street names only, no block numbers.
- 4) Street name signs background shall be Workboy Green in color, with a 1" border.
- 5) Font shall be Federal Highway Series C, 8" (capitol letters) and 6" (lower case letters) in size, white in color.

- 6) Street name signs shall be flush mount.
- 7) Street name signs shall meet latest edition of California Manual on Uniform Traffic Control Devices (CA MUTCD) standards.

### **1.13 - EMERGENCY VEHICLE PREEMPTION**

- 1) Emergency vehicle pre-emption (EVPE) shall be provided for all approaches.
- 2) Emergency vehicle pre-emption shall conform to the latest provisions of the Caltrans Standard Specifications and Special Provisions.
- 3) The emergency vehicle pre-emption (EVPE) shall be an Opticom System. EVPE detector shall be an Opticom Model no. 721, 722, (or approved equal).
- 4) The EVPE discriminator module shall be a current standard Opticom Model no. 764 (or approved equal).
- 5) The detector shall be mounted on the mast arm or approved location using an astro bracket with threaded nipples and lock washers.
- 6) EVPE detectors shall not be mounted on the signal head, unless exception made by City staff.

### **1.14 - SIGNAL HEADS**

- 1) All traffic and pedestrian signal section housings shall be black polycarbonate per the latest edition of the Caltrans Standard Specifications.
- 2) All LED traffic signal modules shall be fully compliant with the latest Institute of Transportation Engineers (ITE) specifications and circular supplements.
- 3) All (red, yellow, and green) LED (light-emitting diode) signal modules shall be Type 1 and meet the following specifications:
  - a. LED signal modules for all solids and arrows shall be twelve-inch diameter (12").
  - b. LED signal modules shall be complete and factory installed in the signal sections
  - c. LED signal modules shall be mounted and soldered onto a printed circuit board
  - d. LED signal modules for all solids and arrows shall be clear faced.
- 4) LED signal module shall have a minimum 5-year warranty beginning after traffic signal system has been accepted by the City.
- 5) Each LED product bid must be certified in the Intertek LED Traffic Signal Module Certification Program. Proof of certification must be documented and approved by the Engineering Division Inspector prior to installation.
- 6) The City does not allow any heads smaller than 12".

#### **1.14.1 – Vehicular Signal Heads**

- a) Signal heads should be located as follows:
  - i. Provide a minimum of three vehicular signal heads for all phases, unless otherwise specified.
  - ii. Provide a minimum of 50 feet from the limit line to the far side indications
  - iii. Provide a maximum of 150 feet from the limit line to the far side indications, unless a near side indication is installed.
  - iv. There should be two signal heads for the through movement visible within a 40 degree cone measured at the center of the approach at a point 10 ft behind the limit line (20 degrees to the right and 20 degrees

to the left of the center of the approach extended, see CAMUTCD, Figure 4D-4)

- b) All signal faces shall have one-piece backplates, and tunnel visors.
- c) All yellow backplates shall have a retroreflective 3" border with 3M 3990 sheeting if requested by City staff during the pre-design job walk.
- d) Left turn signal modules shall be all arrows
- e) Terminal block shall be mounted in red section on the MAS signal heads. There shall be a drip loop for field installed signal wires.
- f) Mast arm signal heads shall all be MAS type mount.
- g) MAT type mounts shall not be used unless otherwise approved by City staff.

#### **1.14.2 - Pedestrian Signal Heads**

- a) All pedestrian indications shall be of the LED type.
- b) All new traffic signals and traffic signal modifications with pedestrian phasing shall use pedestrian indications of the "Countdown" type. For traffic signal modifications, new pedestrian housings may be necessary to accommodate the "Countdown" type pedestrian indications.
- c) All pedestrian heads shall be side mounted.

#### **1.15 - PEDESTRIAN PUSH BUTTON ASSEMBLY**

- 1) If the signal standard is more than 5 feet from the landing area of the curb ramp (see latest edition of CA MUTCD for more details), then install the push button(s) on a push-button pole adjacent to the curb ramp.
- 2) If pedestrian push button location does not meet ADA requirements for a 4' x 4' landing, then install the push button(s) on a push-button pole per City approved location.
- 3) Pedestrian push buttons shall be 2-inch minimum in diameter complying with all Federal and State ADA requirements.
- 4) The pedestrian push button assembly shall be Type B with a five inch (5") by seven inch (7") international symbol push button plate and install height per the latest edition of the Caltrans Standard Specifications.
- 5) The push button frame shall include adjustable mounting brackets to accommodate most standard Caltrans traffic signal poles.
- 6) The pedestrian push button housing shall be:
  - a. Made of die cast aluminum.
  - b. A telescoping, vandal-proof design.
  - c. Painted a Federal Standard color yellow.
- 7) Plastic push buttons housings are not acceptable.
- 8) Accessible Pedestrian Signal (APS) push buttons may be required at the City's discretion, at locations identified during the pre-design job walk. Possible locations include, but are not limited to: schools, senior areas, hospitals, heavy pedestrian areas, etc. Specific APS manufacturer will be determined by the City staff.
- 9) Pedestrian push button location shall meet latest edition of CA MUTCD.

### **1.16 - LED BLANKOUT SIGN**

- 1) LED Blank-out signs may be used at specific locations (upon approval by City staff) to minimize undesirable vehicular or pedestrian movements.
- 2) The signs shall be compliant with the latest CA MUTCD requirement.
- 3) The window dimensions shall be 24"x24" for near side sign, and 30"x30" for far side sign.

### **1.17 - SPEED RADAR SIGNS**

- 1) Speed radar signs shall be Fortel VCalm VMS-C units or approved equal.
- 2) Speed radar signs shall be solar powered, unless otherwise approved by City staff.
- 3) Speed radar signs shall be programmed with a SD card.

### **1.18 - SAFETY LIGHTING STANDARDS**

Safety lighting luminaires above the traffic signals shall conform to the City of Oceanside Street Light Design Policy Manual for New LED Street Light Installations.

- Have twelve feet (12') minimum and fifteen feet (15') maximum mast arms unless otherwise directed by City staff.

### **1.19 - SALVAGED EQUIPEMENT**

The CONTRACTOR shall deliver all equipment to the City of Oceanside Operations Center (4927 Oceanside Blvd), unless otherwise specified to dispose. All unusable equipment shall be lawfully disposed of by the contractor at the contractor's expense.

### **2.0 - TRAFFIC SIGNAL COMMUNICATION CABLE**

- 1) Traffic signal communication cable shall be provided on all new traffic signals and existing traffic signal modifications to all adjacent traffic signals.
- 2) All traffic signal communication cable designs shall be fiber optic unless otherwise approved by the City Traffic Engineer and shall be designed and installed per the latest edition of the Caltrans "Fiber Optic Design Guidelines."
- 3) Under special conditions wireless or other methods of interconnect may be used when approved by City staff.
- 4) The existing SIC system shall be maintained at all times during construction. In the event of damage, the CONTRACTOR or responsible party, as determined by the project inspector, shall commence repairs immediately. Repairs shall be completed within 2 working days or the City shall have the option to complete necessary repairs and charge the responsible CONTRACTOR(s) for any associated repair costs.

### **2.1 - CONDUIT**

- 1) All communication cable conduit runs shall be schedule 40 rigid PVC, quantity (2), size (3") minimum, unless specified on signal plans. All conduits shall have mule tape and shall contain a No. 8 green insulated stranded copper trace wire

- 2) All new intersections shall include separate conduits for SIC and signal wiring (including DLC). Sharing of the DLC and CCTV wiring in the same conduits with SIC will be allowed on intersection modifications, as long as conduit fill is less than 40%, and it is approved by City staff.
- 3) All conduits entering pull boxes, vaults and cabinets shall be protected with duct seal. No open holes are allowed.
- 4) Install conduit to a depth of not less than 30 inches below finished grade, except in sidewalk and curbed paved median areas, where it must be at least 18 inches below grade, unless otherwise approved by City staff.
- 5) See Section 1.3 of this Specification for additional conduit information.

## **2.2 - INTERCONNECT PULL BOXES AND VAULTS**

- 1) All interconnect pull boxes shall be #5 concrete and installed per the latest Caltrans Standard Plans except as approved by City staff for existing facilities.
- 2) Interconnect pull box lids shall be stamped "Traffic Signal".
- 3) Boxes shall be installed 300 feet (maximum) apart unless geographical or site conditions necessitate a shorter run, or as approved by City staff.
- 4) CONTRACTOR shall install a minimum 30" x 60" x 36" concrete electrical vault with two (2) extensions (total depth approximately 3 feet) and a galvanized steel lid at each signalized intersection on the corner near the traffic signal controller, unless otherwise approved by City staff.
- 5) SIC conduit shall be installed in pull boxes using 45-degree, UL approved elbows. These elbows shall be placed as far apart in the pull box as possible, oriented in the direction of the cable, and offset to one side to facilitate cable pulling and coiling.
- 6) Approximately 100 feet of SIC slack shall be coiled inside of each vault box (12 and 72 SMFOC). Approximately 100 feet of SIC slack shall be coiled on either side of the splice enclosure where present.
- 7) Approximately 20 feet of SIC slack shall be coiled inside of each pull box.
- 8) Approximately 20 feet of 12 SMFOC slack shall be coiled in the pull box adjacent to the controller cabinet.

## **2.3 - TRACER WIRE**

- 1) All interconnect conduits shall contain a No. 8 green insulated stranded copper trace wire.
- 2) No splices are permitted between pull boxes.
- 3) Proper operation of the tracer wire shall be demonstrated prior to acceptance.

## **2.4 - CABLE**

- 1) All fiber optic cable shall be single mode. Approved cable is Altos All Dielectric Gel Free Cables or approved equal. Product code is 072EW4-T4101D20, or approved equal.
- 2) Cable installed in runs between splice enclosures and termination equipment shall be minimum 12 fiber count. Product code is 012EW4-T4101D20.
- 3) Splices are to be made in splice enclosures in fiber optic vault only. Cable shall be continuous and un-spliced between cabinets. Exceptions must be approved by City staff.
- 4) The design engineer shall perform a site survey to determine slack availability on existing SIC runs, or require cable replacement when sufficient slack is not available.

- 5) A patch panel shall be installed to terminate the 12 SMFOC. In instances where there is insufficient rack capacity, a spider fan out kit shall be installed upon approval of City staff.
- 6) New SIC shall be connected to the City network and a revised assignment table shall be submitted as part of the final design.
- 7) Where existing copper SIC 12 pair #19 PE-89-AL is to be retained, SIC shall be a minimum of (12) twisted pair 20 AWG conductor communication cable with standard color code and water resistant as required by Caltrans specifications. SIC must be approved by the City.

## 2.5 - FIBER OPTIC INTERCONNECT EQUIPMENT

Termination components for vaults and signal cabinets are listed in Table 3 below. The fiber optic cables shall be terminated and/or spliced with these components per the fiber assignment provided by Traffic Engineering during project design or before signal turn-on. A minimum of 5 working days' notice will be required for Traffic Engineering to produce this documentation.

**Table 3: Cabinet and Vault Fiber Termination Components**

Description	Manufacturer	Model
Splice Closures	Corning	SCF-4C18-01-72
Splice Closure Splice Tray	Corning	SCF-ST-099
Splice Housing	Corning	CSH-03U
Splice Trays	Corning	M67-048
Cabinet Termination	Corning	CCS-01U
72 Port Patch Panel with MTP Adapter	Corning	CCHE-CP72-89
12 Port Panel	Corning	CCH-CP12-38
Fiber Distribution Unit	Corning	C-MIC-012
Splice Cassette	Corning	CCH-CS
Jumpers	Generic	SC-LC
Connectors	Generic	SC, LC

## 2.6 - COMMUNICATION DATA NETWORK

The communication protocol shall be Ethernet. New or modified signals shall receive the communication standard components in Table 4.

**Table 4: Data Communication Standards**

Description	Manufacturer	Model
Ethernet Switch	Cisco- Fiber	IE-3400-8T2S-E
	Actelis- Copper	ML688
Power Supply	Cisco	
Cat 6 Patch Cable RJ45	Generic	
Power Connection	Generic	

## **2.7 - ETHERNET SWITCHES**

Ethernet switches shall provide the following functionality:

- 1) All switches shall be managed and support advanced features including:
  - a. Port based VLAN segregation.
  - b. DHCP snooping and/or IGMP snooping
  - c. MAC address filtering
  - d. Quality of Service
  - e. SNMP
  - f. Remote Management
- 2) Fiber uplinks shall be single mode and support 10/100/1000 Duplex Ethernet ports and provide long haul capacity.
- 3) In addition to the above requirements, local switches (located at intersections) shall meet the following requirements:
  - a. Shall be environmentally hardened (-40 to 160 degrees F) and NEMA TS-2 rated.
  - b. Provide a minimum eight ports with a minimum of six 10/100 Base TX copper ports and two duplex fiber uplink ports.
  - c. The fiber uplink ports shall be SC, LX, or LC type connectors. Connectors shall be compatible with Gigabit speed.
  - d. Power supply shall support 120 VAC and/or 24 VDC.
  - e. The switch shall support DIN rail or 19" rack mountable.
- 4) All switches shall provide a minimum 2 year warranty on parts and 1 year "live" technical support (either in person or over the phone) during business hours (either in person or over the phone) during business hours (Pacific time) 9AM to 5PM Monday through Friday, from the date of installation Warranty parts replacement shall be within three business days. A warranty certificate meeting these requirements shall be provided on the date of installation.

The CONTRACTOR shall provide and install all Ethernet switches at the local intersections and test the communication between the field switch and the TMC. The switches shall be configured by City staff with IP addresses during project design or before operational tests. The testing of the Ethernet switches shall provide for the necessary operation of all devices connected to the Ethernet System.

Approved manufacturers of Ethernet communications shall include Cisco. Non-listed manufacturers shall be approved by City staff.

## **2.8 - BROADBAND WIRELESS ETHERNET COMMUNICATION**

The Broadband Wireless Ethernet Communication System shall provide traffic signal and CCTV video and control communication. The CONTRACTOR shall furnish and install such other items or details not mentioned below, that are required to construct a complete and operational system including: antennas, radios, mounting equipment, hardware, cabling, and incidental materials shall be performed, placed, constructed or installed.

The CONTRACTOR shall follow the manufacturer recommendations and instructions for installation.

Wireless communication shall provide the following functionality:

- 1) Support Ethernet communications.

- 2) Support mesh network topology and point-to-point and point-to-multipoint configuration.
- 3) 802.11 Compliant and operate on a license free band.
- 4) Provide a minimum of 54 Mbps data rate.
- 5) Provide a minimum of 10 miles.
- 6) Provide security encryption (WPA, WPA2, MAC, and Radius)
- 7) Be compatible with Ethernet switching and routing protocols including:
  - a. VLAN
  - b. VPN
  - c. DHCP snooping
  - d. Quality of Service
  - e. SNMP
  - f. Remote Management
- 8) Be a NEMA rated enclosure.
- 9) Power supply support 120 VAC and/or 24 VDC.
- 10) All wireless equipment shall provide a minimum 2 year warranty on parts and 1 year "live" technical support (either in person or over the phone) during business hours (either in person or over the phone) during business hours (Pacific time) 9AM to 5PM Monday through Friday, from the date of installation Warranty parts replacement shall be within three business days. A warranty certificate meeting these requirements shall be provided on the date of installation.

The CONTRACTOR shall perform a wireless site survey to determine the exact radio path and signal strength values to each wireless site. The results of the survey (path quality, data integrity, and spectrum analysis) shall be provided to City staff to determine optimized system configuration and performance.

The CONTRACTOR shall test the completed system and ensure the proper functioning of all wireless components and connected devices to the satisfaction of City staff.

Approved manufacturers of Wireless Ethernet communication solutions include: Ubiquity. Non-listed manufacturers shall be approved by City staff.

## **2.9 - CCTV VIDEO NETWORK**

All new traffic signal installations shall include, as part of the standard safety systems, the installation of CCTV camera equipment and transmission equipment and any additional wiring or hardware required to support an operational CCTV system. City staff's requirement for a CCTV video network will be based off a pre-design job walk. Table 5 provides the camera equipment.

- 1) The CCTV communication protocol shall be Ethernet. Ethernet requirements are provided in Section 2.7.
- 2) CCTV power should be POE, and the cabling shall be a shielded Cat 6 cable.
- 3) A License Key shall be provided for each CCTV camera.
- 4) The approved location for new CCTV camera installations shall be specified by City staff.
- 5) Installation: The CCTV system shall be installed per manufacturer's installation recommendations.
- 6) Power for CCTV systems at new intersections shall consist of a power cord plugged into a power strip mounted on the rail of the approved/existing cabinet plugged into Equipment Receptacle 2. The next alternative locations in order of preference are the ECB and least used signal breaker

(auxiliary). The power cord shall be routed through the pole and terminated in the CCTV housing per the manufacturer's instructions.

- 7) The CCTV transmission equipment shall be installed and tested for operation by the CONTRACTOR to the satisfaction of City staff before acceptance of the system.

CCTV Camera and Transmission components required to accommodate a typical CCTV installation are shown in Table 5 below.

**Table 5: CCTV Camera and Transmission Equipment**

Description	Manufacturer	Model
Dome Camera	Bosch	MIC IP dynamic 7000 HD
Pole Mount Bracket	Bosch	MIC-PMB
Wall Mount Bracket	Bosch	MIC-WMB-WD
Shallow Conduit Adaptor	Bosch	MIC-SCA-WD
POE+ Power Supply	Bosch	NPD-6001A
Power Cycle Relay Switch	Digital Loggers, Inc	DIN Relay 4

**2.10 - TESTING**

- 1) The CONTRACTOR will be responsible for ensuring the operability and quality of SIC delivered from the manufacturer before installation. SIC shall not be removed from the reel or installed until it has been successfully tested by the CONTRACTOR. The pre-installation test results shall be documented and provided to the City Traffic Engineer for approval. SIC found to be defective or damaged shall be returned to the source for replacement by the CONTRACTOR.
- 2) Fiber optic SIC shall be installed, spliced, terminated, and tested in accordance with NECA/FOA 301-2009 standards. This includes pre-installation and post installation testing of the cable.
- 3) Pre-installation testing shall be performed on all fibers using an Optical Time-Domain Reflectometer (OTDR) to preclude manufacturing and shipping damage. The CONTRACTOR shall perform such testing either on-site or at a holding facility prior to installing the cable into conduit.
- 4) Post-installation testing of all terminated fibers shall be performed using launch cables at both ends as specified in NECA/FOA 301-2009 Annex B.3. The CONTRACTOR shall perform such testing on-site after all termination and splicing work is completed.
- 5) Test results, in the form of pre-installation test data and post installation OTDR traces, shall be provided to the City Traffic Engineer in a bound hard copy format along with the electronic file and appropriate viewing software, for review and approval after installation and splicing/termination work are completed.
- 6) The pre-installation test results shall be in the form of a spreadsheet detailing the length and loss/km for each fiber as well as the parameters used for testing. The post-installation OTDR traces shall clearly show each continuous fiber, the connectors on each end, and the loss for each event.
- 7) The City Traffic Engineer shall approve the test results before final acceptance.

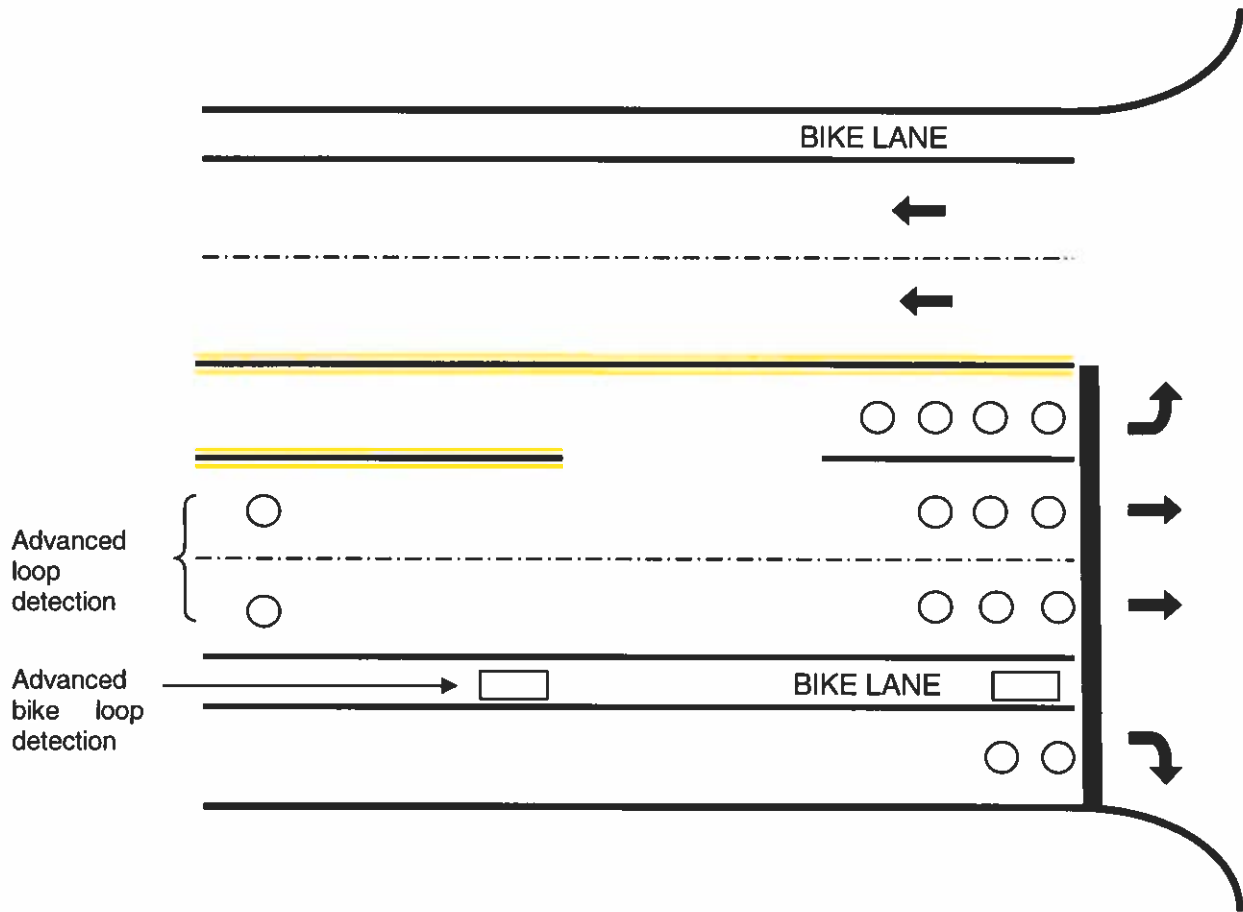
### **3.0 - TRAFFIC SIGNAL GENERAL NOTES**

Below are the City of Oceanside Traffic Signal General Notes that shall be included on all traffic signal plan designs.



- 1) ALL WORK, MATERIALS AND EQUIPMENT SHALL CONFORM TO THE LATEST REQUIREMENTS OF THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION (CALTRANS) STANDARD PLANS AND THE LATEST STANDARD SPECIFICATIONS,
- 2) UTILITIES SHOWN ON THESE PLANS ARE CORRECT AND ACCURATE TO THE EXTENT OF AVAILABLE RECORDS AND KNOWLEDGE. THE CONTRACTOR, HOWEVER, IS REQUIRED TO ASCERTAIN THE EXACT LOCATION OF UNDERGROUND FACILITIES PRIOR TO DOING WORK THAT MAY DAMAGE SUCH FACILITIES OR INTERFERE WITH THEIR SERVICE. ANY DAMAGES CAUSED TO THE UNDERGROUND FACILITIES AND ALL COSTS ASSOCIATED WITH THOSE DAMAGES AND REPAIR COST SHALL BE THE CONTRACTOR'S FULL RESPONSIBILITY.
- 3) THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND NOTIFY ALL UTILITY COMPANIES A MINIMUM OF 48 HOURS PRIOR TO START OF CONSTRUCTION. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE ALL PHASES OF CONSTRUCTION WITH THE VARIOUS UTILITY COMPANIES INVOLVED.
- 4) CONDUCTORS AND POLE SCHEDULES ARE FURNISHED AS INSTALLATION GUIDES ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE THE CORRECT EQUIPMENT REQUIRED FOR INTENDED OPERATION.
- 5) THE CITY TRAFFIC ENGINEER OR HIS/HER DESIGNEE SHALL APPROVE POLE FOUNDATIONS, POLES, LOOP DETECTOR, LOCATION OF CONDUIT RUNS, AND CABINET PLACEMENT IN THE FIELD PRIOR TO INSTALLATION.
- 6) FINAL METHOD OF INSTALLED CONDUIT TO BE SUBMITTED BY THE CONTRACTOR AND APPROVED BY THE CITY TRAFFIC ENGINEER BASED ON BEST INSTALLATION PER PLANS AND FIELD VERIFICATION OF EXISTING CONDITIONS.
- 7) DURING CONSTRUCTION OF PROPOSED CONDUIT, SIC SHOULD BE DISCONNECTED FROM ONE END, REMOVED FROM CONDUIT, AND STORED SECURELY. ONCE THE PROPOSED CONDUIT CONSTRUCTION HAS BEEN COMPLETED REPULL SIC AND RECONNECT. COIL EXCESS SIC SLACK IN VAULTS.
- 8) AT LOCATIONS WHERE PULLBOXES HAVE BEEN REMOVED, BACKFILL AND MATCH TO EXISTING GRADE. IF STREET PAVEMENT SECTION HAS BEEN REMOVED, MATCH TO EXISTING IN KIND PER CITY DETAILS M-2 AND M-3A/M-3B/M-3C. IF LANDSCAPING IS DISTURBED IT SHALL BE REPLACED IN KIND.
- 9) FOR ANY DISTURBANCE OF SIDEWALK, OR ANY SURFACE MATERIALS IN PUBLIC RIGHT OF WAY, CONTRACTOR SHALL REPLACE IN KIND TO MATCH EXISTING SURFACE.

10) CONTRACTOR SHALL PULL NEW #8 STRANDED GROUND WIRE TO ALL EXISTING AND NEW RIGID OR PVC CONDUITS PER N.E.C. CODE. NEW GROUND WIRE SHALL BE BONDED TO EXISTING STEEL POLES.

**SCHEMATIC FOR PRESENTATION PURPOSES ONLY**



**LEGEND:**

-  Vehicle Loop Detection
-  Bicycle Loop Detection



PROJECT

**GENERAL LOOP DETECTION ASSIGNMENT  
(LOOKING ON ONE LEG OF INTERSECITON)**

EXHIBIT  
A