

## **1. Purpose**

The purpose of these City of Redding Construction Standards is to provide minimum standards to be applied to improvements which are to be dedicated to the public and accepted by the City of Redding for maintenance or operation and certain private works, as well as improvements to be installed within existing rights-of-way and easements.

These Construction Standards shall apply to, regulate, and guide construction of streets, highways, alleys, grading, drainage, sewerage, site access, water supply, landscaping, and related public improvements.

All references in this document to “Engineer” denotes “City Engineer.”

The City Engineer may require improvements exceeding the minimum standards established in these Construction Standards when deemed necessary for the health, safety and welfare of the public.

## **2. Availability, Delivery, & Updates**

These standards are available on the City of Redding website, [www.cityofredding.org](http://www.cityofredding.org), under the Public Works, Engineering Division home page, in PDF format.

Future revisions and additions to these standards shall be posted directly to website on the first of each month. The online standards shall be considered the most current version of these standards. In case of a conflict, the online version shall take precedence over and be used in lieu of any other version.

## **3. Reference Documents**

The City of Redding Construction Standards have been designed to the “Standard Specifications For Public Works Construction”, hereinafter referred to as the “Greenbook”, and the “Modifications to the Standard Specifications for Public Works Construction” as detailed in Section B.

Within these standards, where references to the Greenbook and other reference specifications (i.e. ASTM, AASHTO, AWWA, CA-MUTCD, etc.) have been referred to, the applicable portion of such specifications shall become a part of these Construction Standards. In case of conflict between the Construction Standards and another specification, the Construction Standards shall take precedence over and be used in lieu of the conflicting portions.

The current edition of the Standard Specifications at the time of this publication is the 2015 Edition and there are no supplements available. Copies of the “Standard Specifications for Public Works Construction” may be obtained from Building News, Inc., 1612 South Clementine Street, Anaheim, CA 92802 (714) 517-0970 or online at [www.bnibooks.com](http://www.bnibooks.com).

## ***MODIFICATIONS TO THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION***

The Construction Standards contained herein shall be done in accordance with the Standard Specifications for Public Works Construction, commonly known as the "Greenbook", insofar as the same may apply and in accordance with the following Modifications to the Standard Specifications for Public Works Construction.

In case of conflict between the Standard Specifications and these Modifications to the Standard Specifications, these Modifications to the Standard Specifications for Public Works Construction shall take precedence over and be used in lieu of the conflicting portions.

## **PART 2 MODIFICATIONS TO CONSTRUCTION MATERIALS**

### **SECTION 200-2 UNTREATED BASE MATERIALS**

#### **200-2.2.2 Grading**

Delete this paragraph and substitute the following:

The aggregate shall be uniformly graded and shall conform to the State of California Department of Transportation Standard Specifications Section 26 "Aggregate Base" grading requirements for Class 2 Aggregate Base, 3/4-inch (20 mm) maximum size.

### **SECTION 201-1 PORTLAND CEMENT CONCRETE**

#### **201-1.1.2 Concrete Specified by Class and Alternate Class**

Add the following sentence to the first paragraph:

Concrete used in the construction of curb, gutter, sidewalk, driveway, and alley aprons shall be Class 470-C-2500 with a maximum four inch (100mm) slump.

### **SECTION 203-6 ASPHALT CONCRETE**

#### **203-6.1 General**

The first sentence of the first paragraph is amended to read:

"...mineral aggregate and up to 25 percent reclaimed asphalt pavement (RAP)..."

Delete the second paragraph.

The third paragraph is amended to read:

"Unless otherwise specified, the Contractor shall submit a mix design for 1/2 inch, Type A Hot Mix Asphalt with PG 64-10 that has been pre-approved by the California Department of Transportation (Caltrans) or is in compliance with the current Caltrans Standard Specifications.

### **SECTION 207-1 NONREINFORCED CONCRETE PIPE**

Add the following paragraph:

Nonreinforced concrete pipe shall be extra strength.

## **SECTION 207-2 REINFORCED CONCRETE PIPE (RCP)**

### **207-2.1 General**

The second paragraph is amended to read:

The size, type, and strength class of the concrete pipe to be furnished shall be as shown on the Plans.

### **207-2.9.1 General**

The last sentence is amended to read:

- 3) Acceptance of certification of compliance with these specifications, and inspection of the completed pipe.

Add the following paragraph:

The basis for acceptance shall be by certification of compliance with these specifications and inspection of the completed pipe.

## **SECTION 207-15 ABS SOLID WALL PIPE**

### **207-15.1 General**

The third sentence is modified to read:

Minimum wall thickness shall correspond with SDR 23.5

## **SECTION 207-17 PVC GRAVITY PIPE**

Table 207-17.1 is modified to read:

Wall Thickness Min. SDR 26

Polyvinyl chloride plastic pipe (PVC) for water lines shall be AWWA C 900, DR18 (Class 150).

## **SECTION 210-1 PAINT**

### **210-1.5 Paint Systems**

Add the following:

All components to be painted shall be painted as follows:

1. **Preparation** - Painting preparation shall be accomplished using an industrial strength, biodegradable cleaner to remove all dirt, grease, oil and other contaminants. Surfaces

shall be thoroughly power washed with water to ensure all residues have been removed. Provide Devoe Devprep 88 or equal.

Aluminum surfaces to be painted shall be treated as described above, then treated with an etching wash such as Jasco Pep and Primer or equal.

Pre-painting preparation shall include removal of all paper signs, masking tape, scotch type, and similar contaminants that exist on surfaces to be painted.

2. **Primer** - The primer shall be a low VOC, two component high performance, rust inhibitive epoxy coating. Primer thickness shall be 4-8 mils. when dry, 6-8 mils. when wet. Provide Devoe Devran 203 water borne epoxy primer or equal.

Choose **one** of the following, as appropriate:

3. **Finish Coat** - The finish coat shall be a low VOC, two component high performance chemically-cured Aliphatic Urethane Gloss Enamel. Finish coat thickness shall be 2-3 mils when dry, 2.8-4.3 mils when wet. Provide Devoe Devthane 379H or equal

**OR**

3. **Finish Coat** - The finish shall be powder coated with Tiger Drylac Series 38 glossy UV-resistant TGIC Polyester. Color shall be City of Redding light pole green. Samples will be made available to the Contractor for color matching.

The industrial cleaner, primer and finish coat shall all be produced by the same manufacturer and shall be compatible and appropriate for the intended application.

Paint color shall be City of Redding light pole green. Color samples will be provided to the Contractor for color matching.

Five copies of the cleaner, etching wash, primer, and paint specifications including MSDS sheets, shall be submitted to the Engineer for review prior to the start of work.

All work of this item of work shall be done between the hours of 9 p.m. and 6 a.m.

The contract lump sum price paid for "Paint Traffic Signal" at each location shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in painting all the traffic signal equipment at an intersection complete in place, including preparing surfaces, cleanup, and all extra work and equipment needed to do this item of work at night as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

## **SECTION 217 BEDDING AND BACKFILL MATERIALS**

### **217 Bedding Material**

#### **217-2.3 Imported Backfill**

Add the following paragraph:

Backfill material shall be 3-inch (75mm) maximum in size and shall be reasonably well graded. Any material proposed to be used that has 30 percent or more not passing the ¾-inch (20mm) sieve will be rejected.

## **PART 3 MODIFICATIONS TO CONSTRUCTION METHODS**

### **SECTION 300-1 CLEARING AND GRUBBING**

#### **300-1.3.2(a) Requirements**

The second sentence of the first paragraph is amended to read:

Sawcutting of edges is required when shown on the plans or directed by the Engineer.

#### **300-1.3.2(c) Requirements**

The following sentence is added:

Where concrete to be removed is adjacent to asphalt concrete that is to remain in place, the edge of the asphalt concrete that is exposed shall be prepared to a neat and straight line prior to backfilling.

### **SECTION 300-2 UNCLASSIFIED EXCAVATION**

#### **300-2.2.2 Wet Material**

This Section is amended to read:

If required excavated material is unsatisfactory for the specified use on the project solely because of high moisture content, the Contractor may either process the material to reduce the moisture content to an optimum condition, or to remove the material and replace it with suitable material. The cost of drying or removing and replacing the wet material shall be at the expense of the Contractor.

#### **300-2.6 Surplus Material**

Add the following paragraph after the first paragraph:

Surplus material excavated from the site shall be placed along the roadway to flatten fill slopes and placed in other locations when directed by the Engineer. Compaction shall be by wheel rolling as occurs during placement.

#### **300-2.8 Measurement**

Delete all paragraphs of this subsection and add the following:

There will be no measurement of material excavated from this site.

Add the following paragraphs:

The quantities used in determining payment for unclassified excavation shall be those of the completed excavation as calculated utilizing the authorized cross sections.

### **300-2.9 Payment**

Delete the first sentence of the first paragraph and substitute **one** of the following, as appropriate:

Payment for all unclassified excavation shall be included in the unit price paid for the various items of work done at the different locations.

**OR**

Full compensation for all unclassified excavation shall be considered as included in the contract lump sum price paid for "clear and grub" and no separate payment will be made therefor.

The second sentence of the first paragraph shall read as follows:

"Payment for unclassified excavation shall include full compensation for excavating, sloping, rounding tops and ends of excavations, loading, disposing of surplus material, stockpiling, and hauling it to its final location, grading, shaping, compacting or consolidating, or other work required under this subsection and subsection 300-4 Unclassified Fill."

## **SECTION 300-4 UNCLASSIFIED FILL**

### **300-4.1 General**

Add this sentence to the first paragraph:

Embankment shall be designated as unclassified fill.

Add the following paragraphs:

The preparation, placing, compacting, and other procedures of fill materials (topsoil Class "A") shall be in conformance with applicable provisions of this section.

The fill material (topsoil Class "A") shall be placed on the site as shown on the drawings. The extent of the placement quantities in the site shall be determined by the Engineer.

### **300-4.10 Measurement and Payment**

The first paragraph is amended to read as **one** of the following, as appropriate:

Full compensation for unclassified fill shall be considered as included in the contract price bid for unclassified excavation; and shall include full compensation for all grading, shaping, compacting or consolidating, or other work that is required under this subsection.

**OR**

The Lump Sum Price bid for "grading" shall include full compensation for all the grading, shaping, compacting or consolidating, or other work that is required under this subsection.

**OR**

Full compensation for unclassified fill shall be considered as included items involved and no further separate payment will be made therefor.

## **SECTION 300-5 BORROW EXCAVATION**

### **300-5.2 Imported Borrow**

The second paragraph is amended to read as follows:

The Contractor shall notify the Engineer sufficiently in advance of opening any borrow site so that adequate time will be allowed for testing the material.

### **300-5.4 Measurement and Payment**

Add the following paragraphs:

The quantity for measurement of imported borrow shall be that quantity remaining after deducting the calculated unclassified excavation quantity utilizing the cross sections provided in the plans.

Payment for imported borrow shall include full compensation for excavating, sloping, loading, stockpiling, hauling it to its final location, and doing all work involved in unclassified fill construction.

## **SECTION 301-1 SUBGRADE PREPARATION**

### **301-1.2 Preparation of Subgrade**

Add the following paragraphs:

Preparation of subgrade shall include the cutting and trimming of existing AC surfaces to neat straight lines as delineated by the Engineer. It shall also include the excavation and removal of all unclassified excavation material and existing AC surfacing.

Existing AC removed may be incorporated into the embankment to be constructed provided it is smaller than six inches (150mm) in its largest dimension and well distributed throughout the embankment material.

Add the following paragraph:

After the removal of the existing concrete, or unclassified excavation, the areas shall be prepared as outlined above, aggregate base material added where needed, and the entire area compacted by the use of vibratory plate-type equipment to the specified relative compaction.

**301-1.3      *Relative Compaction***

Delete the first paragraph and add the following paragraph:

The top six inches of subgrade material shall be compacted to a relative compaction of 95 percent, except subgrade under driveways and sidewalks shall be compacted to a relative compaction of 90 percent.

**301-1.7      *Payment***

Add the following paragraph:

Payment for furnishing and placing additional aggregate base materials and the mechanical compaction of all areas shall be considered as included in the unit prices paid for the work involved, and no additional compensation will be allowed.

**SECTION 301-2   *UNTREATED BASE***

**301-2.1   *General***

The paragraph is amended to read:

Untreated base for pavement, curb, gutter, and similar types of improvements, shall be constructed of material as specified in subsection 200-2 and as modified in these specifications.

**301-2.4   *Measurement and Payment***

The following sentence is added to the first paragraph:

Payment for furnishing and placing aggregate base shall be considered as included in the unit price paid for concrete sidewalk, concrete walk, concrete curb, concrete curb and gutter, concrete driveway, concrete bus turnout, concrete alley entrance, concrete cross gutter, concrete alley and valley gutters, concrete curb ramps complete in place and no additional compensation will be allowed.

**SECTION 302-5   *ASPHALT CONCRETE PAVEMENT***

**302-5.1   *General***

Add the following paragraph after the first paragraph:

The Contractor shall furnish and place all temporary striping and markings in accordance with the California MUTCD.

### **302-5.4 Tack Coat**

Add the following sentence to the first paragraph:

When asphaltic emulsion is used as a tack coat, asphalt concrete shall not be placed until the emulsified asphalt has cured.

In the first and third paragraphs, the tack coat shall be Grade CSS-1h or SS 1 emulsified asphalt.

### **302-5.9 Measurement and Payment**

The first sentence of the first paragraph shall read:

Payment for permanent resurfacing shall be considered to be included in the price bid for pipe and appurtenances or structures complete in place, and no additional compensation will be allowed.

The second sentence of the first paragraph shall read as **one** of the following, as appropriate:

Such price shall constitute full compensation for preparation of subgrade, apply tack coat if required, and placement of temporary striping and markings.

**OR**

Such price shall constitute full compensation for furnishing and placing of materials required to complete the pavement, including the preparation of subgrade, and tack coat if required; placement of temporary striping and markings; fog seal; adjusting monuments, valve box covers, and manholes to grade; and for all labor, equipment, tools, and incidentals needed to complete the work in conformity with the plans and specifications.

Add the following paragraph:

Prime coat shall be paid for at the contract price per ton. The contract unit price shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all work involved in placing the prime coat complete in place.

## **SECTION 303-1 CONCRETE STRUCTURES**

### **303-1.9.1 General**

Add the following sentence to the second paragraph:

All concrete structures shall be given an Ordinary Surface Finish.

### **303-1.11 Payment**

Delete the first sentence of the first paragraph and substitute the **one** of the following, as appropriate:

Payment for concrete structures shall be considered as included in the unit price bid for the various items to which the concrete is pertinent, and no additional compensation will be allowed.

**OR**

Payment for concrete structures complete in place shall include full compensation for the furnishing and placing aggregate base and asphalt concrete resurfacing, and no additional compensation will be allowed.

## **SECTION 303-5 CONCRETE CURBS, WALKS, GUTTERS, CROSS GUTTERS, ALLEY INTERSECTIONS , ACCESS RAMPS, AND DRIVEWAYS**

### **303-5.1.1 General**

Delete the second sentence of the first paragraph and substitute the following:

Cement mortar shall **not** be used in finishing curbs.

The first sentence of the second paragraph shall read:

The minimum thickness of walks shall be four inches (100mm) adjacent to vertical curb and the minimum thickness of walks shall be six inches(150mm) adjacent to roll curb."

### **303-5.1.3 Driveway Entrances**

Delete the first sentence of the second paragraph and substitute the following:

"The fully depressed curb opening at driveway entrances shall be ½-inch (13mm) plus or minus 1/8-inch (3mm) above gutter flow line at the curb face."

The last sentence of the third paragraph shall read:

"At residential driveways, the thickness of the walk will be six inches (150mm) unless otherwise specified."

### **303-5.4.2 Expansion Joints**

The first sentence of the second paragraph shall read:

"One-half inch (½-inch) joints..."

Delete the first sentence of the third paragraph and substitute the following:

Expansion joint filler ½-inch (13mm) thick shall be placed in walk at the BC and EC of all walk returns, around all utility poles which may project into the concrete along the line of the work, at commercial driveways, and between the walk and all buildings or other structures at the right of way line or when required by the Engineer.

### **303-5.4.3 Weakened Plane Joints**

The second and third paragraphs are amended to read as follows:

"...intervals not exceeding 12 feet."

### **303-5.5.2 Curb**

Delete the last two sentences of the first paragraph and substitute the following:

Cement mortar shall **not** be used in finishing curb.

The last sentence of the second paragraph is amended to read:

The surface of the work shall be finished as prescribed; after which the name of the Contractor, together with the year in which the improvement is constructed, **may** be stamped therein to a depth of ¼-inch in letters not less than ¾-inch high, at BC and EC of curb returns.

### **303-5.9 Measurement and Payment**

Add the following paragraph:

Full compensation for all required saw cutting, excavation, removal, and disposal of concrete rubble and asphalt concrete pavement, aggregate base placed under curbs, gutters, sidewalks, bus turnouts, and driveways, asphalt concrete tie-in paving and any other items of work necessary to construct curb, gutter, sidewalks, handicap ramps, and driveways shall be considered as included in the unit prices paid for the various items to which the work is pertinent.

Delete the first paragraph and substitute the following:

Curb and gutter shall be measured continuous through driveways, handicap ramps, and curb returns. Curb and gutter shall be measured at the top face of curb. Unless otherwise specified elsewhere in these special provisions, curb and gutter shall be paid for at the linear foot price set forth in the bid documents. Local depressions at catch basins shall be included in the unit price paid for catch basins. Curb and gutter for bus turnouts and cross gutter spandrels shall be included in the unit price paid for bus turnouts and cross gutter.

## **SECTION 306 OPEN TRENCH CONDUIT CONSTRUCTION**

### **306-4 SHORING AND BRACING**

All excavations shall be shored per CAL-OSHA requirements.

Work in excavations over 60 inches (5 feet) in depth shall be in strict conformance with CAL-OSHA requirements.

In the event that the trenching operation exceeds 5 feet in depth, the Contractor shall be responsible for providing and installing trench shoring as required by Cal-OSHA and the cost for such shoring shall be included in the price paid for "Trench Sheet piling and Shoring" and no additional compensation will be allowed.

On Public Works' construction, it shall be understood that the Owner, Owner/Operator, etc., shall be considered the same as an employee or workman for determining conformance with the CAL-OSHA requirements.

### **306-6 BEDDING**

#### **306-6.1 General**

Delete the second sentence of the fourth paragraph and add the following:

If soft, spongy, unstable, or other similar material is encountered upon which the bedding material or pipe is to be placed, this unsuitable material shall be removed to a depth ordered by the Engineer and replaced with trench stabilization material suitably densified. The Engineer may also require an envelope of an approved filter fabric be installed around the stabilization material if it appears migration of adjacent materials into the stabilization material could be a problem. Addition of trench stabilization material so ordered will be paid for as specified in the Section Extra Work in the General Provisions. The Contractor shall bear any additional expense for trench excavation, shoring, or dewatering. If the necessity for such trench stabilization material has been caused by an act or failure to act on the part of the Contractor, the Contractor shall bear the entire expense of the additional material.

### **306-8.9 Pipeline Pressure Testing, Disinfection, and Commissioning**

#### **306-8.9.1 General**

Add the following sentence to the first paragraph:

All chlorination, flushing, and testing of new lines shall be accomplished prior to any tie-ins to existing water lines.

#### **306-8.9.2 Hydrostatic Pressure Test**

Delete this section in its entirety and refer to the City of Redding Construction Standards Page 400.50.

#### **306-8-9.4.3 Potable Water System Disinfection**

Delete this section in its entirety and refer to the City of Redding Constructions Standards Page 400.40.

### **306-12.4 Jetted Trench Backfill**

Replace this section with the following:

Jetting shall not be considered as a suitable method of compaction.

**306-13.1 Temporary Resurfacing**

Add the following paragraph:

Temporary resurfacing of trenches shall be completed at the end of each work day unless otherwise approved by the Engineer.

**306-15 Payment**

In Item m), substitute "including" for "excluding" in reference to temporary resurfacing.

Add the following paragraphs:

All temporary and permanent striping, marking and markers, abandoning existing sewer (and laterals) and or/water which includes filling the exposed end of the pipe with a minimum of 2 feet of concrete and ensuring that plug is watertight and capable of withstanding all internal and external pressures without leakage, and Class 200 (DR14) C-900 pipe (as required), and couplers necessary to connect to existing sewer mains.

The contract unit price paid for "Sanitary Sewer Lateral (Reconnect)" shall include full compensation for furnishing all labor, material, tools, equipment, and incidentals, and for doing all the work involved in replacing a live sanitary sewer lateral, complete in place, including sawcutting existing paving, off-site disposal of concrete and asphalt rubble, existing pipe, trench spoils, excavating, dewatering, one-way lateral cleanout with cast iron traffic lid and precast concrete block (where required), lateral pipe material, backfill and compaction, replacing curb, gutter, and sidewalk; connecting to the sanitary sewer main; and all necessary coordination with City staff, as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**306-15.9 Temporary Resurfacing**

Replace this section with the following:

Payment for temporary resurfacing shall be considered to be included in the price bid for the various items of work and no additional compensation will be allowed.

## **SECTION 314-4 APPLICATION OF TRAFFIC STRIPING AND CURB AND PAVEMENT MARKINGS**

### **314-4.4.1 General**

Replace this section with the following paragraphs.

All traffic striping and pavement markings shall be thermoplastic and Sections 84-1 and 84-2 of the Caltrans Standard Specifications, latest edition, are here by made a part of these specifications as though fully contained herein, except that the minimum thickness of traffic stripes and pavement markings shall be as follows:

Traffic Stripes - 90 mil.

Pavement Markings - 120 mil.

#### **For Trails only, add the following:**

Traffic stripe shall be 3-lineal-foot broken stripe with 9 lineal feet between each stripe.

Unless otherwise directed by the Engineer, all new traffic striping and pavement markings shall be as shown on the drawings.

The Engineer shall have 72 hours to review and approve all cat tracking prior to application of striping and pavement markings.

### **314-4.4.5 Measurement**

Replace the first paragraph with the following paragraphs:

Traffic stripes will be measured by the linear foot along the line of the traffic stripe without deduction for gaps in broken traffic stripes. A double traffic stripe, consisting of two 4-inch wide yellow stripes, will be measured as two traffic stripes.

Pavement markings will be measured by the square foot and will include all crosswalk bars, limit lines, arrows, words, and bike lane symbols.

Traffic stripes, pavement markings, and permanent pavement markers shall not be applied to new paved surfaces until a minimum of seven days curing time has elapsed.

### **314-4.4.6 Payment**

**Add the following paragraph:**

At work areas consisting only of "Replace Asphalt Concrete Surfacing," pavement markings and striping shall be replaced as directed by the Engineer. Payment for marking and striping will be in accordance with the bid schedule prices.

**PART 4 MODIFICATIONS TO ALTERNATE ROCK PRODUCTS, ASPHALT CONCRETE,  
PORTLAND CEMENT CONCRETE, AND UNTREATED BASE MATERIAL**

**SECTION 400-4 ASPHALT CONCRETE**

**400-4.1 General**

The first sentence of the first paragraph is amended to read:

"...mineral aggregate and up to 25 percent reclaimed asphalt pavement (RAP)..."

Delete the second sentence of the second paragraph and substitute the following:

"Asphalt concrete shall conform to the requirements of PG 64-10, same as the State of California Department of Transportation Standard Specifications, Type A, ½-inch (13mm) maximum size aggregate, medium grading.

The third sentence of the second paragraph is amended to read:

"Asphalt concrete containing up to 25 percent RAP..."

**400-4.2.1 Asphalt**

This section shall read as follows:

The asphalt to be mixed with the mineral aggregate shall be paving asphalt, viscosity grade PG 64-10, conforming to the provisions of Section 203-1.

**400-4.3 Combined Aggregates**

The fourth paragraph shall read as follows:

The grading of the combined aggregates shall conform to the grading for Type III asphalt concrete, Class C3 of this subsection, same as the State of California Department of Transportation Standard Specifications, Type A, ½-inch (13mm) maximum size aggregate, medium grading.

**PART 5 MODIFICATIONS TO PIPELINE SYSTEM REHABILITATION**

## **PART 6 MODIFICATIONS TO TEMPORARY TRAFFIC CONTROL**

### **Section 600 Access**

#### **600-1 General**

Add the following paragraphs after the second paragraph:

The Contractor shall provide traffic control during all construction survey staking to be performed by City staff.

The Contractor shall submit traffic control plans for review, revision, and/or approval by the Engineer. The Contractor shall allow a minimum of five (5) working days for review and shall not begin work until plans are approved. The control measures shall be in conformance with the California Manual of Uniform Traffic Control Devices (CA-MUTCD). The Engineer shall reserve the right to stop any construction activity from proceeding if the work involves traffic detours and/or controls that have not been previously approved or are not in conformance with the approved plan. The Contractor shall not be allowed to claim damages for delay arising from work stoppages by the Engineer in cases involving unauthorized or improper traffic control regulations.

The Contractor shall designate a person whose sole responsibility is to manage the coordination of all traffic control, the traffic control plan, public notification, automobile removal, and other activities necessary to minimize the inconvenience to the public. The Contractor shall provide a sufficient number of workers to assist the designated person with coordination of all traffic control, traffic control plan, public notification, automobile removal, and other activities necessary to minimize the inconvenience to the public. The designated person shall be available to the Engineer, inspectors and the public for the duration of the contract through the use of a cellular phone. The phone number for the designated person shall be listed on all notifications and correspondence with the public. The designated person shall be responsible for coordinating, submitting, making changes to, submitting proposed revisions to, and maintaining the traffic control plan and implementing all traffic control measures.

## **PART 7 MODIFICATIONS TO STREET LIGHTING AND TRAFFIC SIGNAL SYSTEMS**

Delete Part 7 in its entirety and replace with the following:

### **700 STREET LIGHTING AND TRAFFIC SIGNALS**

#### **A. Scope of Work**

The work to be performed under this portion of the contract consists of installing a complete traffic control and lighting system with traffic count loop detectors, and such other items or details not mentioned above that are required by the plans, Standard Specifications, or the Special Provisions to make a complete and operational system.

#### **700-1 General**

Traffic signals, lighting, monitoring stations, and communication conduit shall conform to the standard provisions of Section 86, "Signals, Lighting, and Electrical Systems," of the State of California Department of Transportation Standard Specifications and these special provisions.

Locations of traffic monitoring installations are shown on the plans.

Traffic signal work shall be performed at the following location:

Location 1: *Signal Location 1*

Location 2: *Signal Location 2*

#### **Cost Break-Down**

Cost break-downs shall conform to the provisions in Section 86-1.03, "Cost Break-Down," of the State of California Department of Transportation Standards Specifications and these special provisions.

The Engineer shall be furnished a cost break-down for each contract lump sum item of work described in this section.

The cost break-down shall be submitted to the Engineer for approval within fifteen days after the contract has been approved. The cost break-down shall be approved, in writing, by the Engineer before any partial payment for the items of electrical work will be made.

#### **Equipment List and Drawings**

The controller cabinet schematic wiring diagram and intersection sketch shall be combined into one drawing, so that, when the cabinet door is fully open, the drawing is oriented with the intersection.

A maintenance manual shall be furnished for all controller units, auxiliary equipment, and vehicle detector sensor units, control units, and amplifiers. The maintenance manual and operation manual may be combined into one manual. The maintenance manual or combined

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

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

### **307-4 TRAFFIC SIGNAL CONSTRUCTION**

#### ***Maintaining Existing and Temporary Electrical Systems***

Traffic signal system shutdowns are not permitted.

#### ***Standards, Steel Pedestals, and Posts***

Where the plans refer to the side tenon detail at the end of the signal mast arm, the applicable tip tenon detail may be substituted. All mast arm mounted signal heads shall be mounted with a Pelco Bracket (AS-0125) or approved equal.

The sign mounting hardware shall be installed at the locations shown on the plans.

Sign panels and sign mounting hardware shall be furnished and installed at the locations shown on the plans by the Contractor. When nonilluminated street name signs are called out on the plans sign mounting hardware for street name signs mounted on signal mast arms shall be supplied by the City. Brackets shall be attached to signal mast arm by strap and saddle bracket method.

#### ***Conduit***

Conduit to be installed underground shall be Type 3 per Section 86-2.05A of the California Department of Transportation Standard Specifications; unless otherwise specified elsewhere. Detector termination conduits shall also be Type 3.

Conduit from the standard to the adjacent pull box shall be 2-inch minimum, conduit to all detector loops under curbs shall be 1 ½-inch minimum.

Conduit sizes shown on the plans and specified in the Standard Specifications and these special provisions are referenced to metallic type conduit. When rigid nonmetallic conduit is required or allowed, the normal equivalent industry size shall be used as shown in the following table:

<b><i>Size Designation for Metallic Type Conduit</i></b>	<b><i>Equivalent Size for Rigid Nonmetallic Conduit</i></b>
21	20
27	25
41	40
53	50
63	65
78	75
103	100

When Type 3 conduit is placed in a trench (not in pavement or under portland cement concrete sidewalk), after the bedding material is placed and the conduit is installed, the trench shall be backfilled with commercial quality concrete, containing not less than 610 lbs of portland cement per cubic yard, to not less than 4 inches above the conduit before additional backfill material is placed.

Conduit runs shown on the plans to be located behind curbs may be installed in the street, within 3 feet of, and parallel with the face of the curb, by the "Trenching in Pavement Method" in conformance with the provisions in Section 86-2.05C, "Installation," of the California Department of Transportation Standard Specifications. Pull boxes shall be located behind the curb or at the locations shown on the plans.

All conduit to inductive loops shall extend three feet beyond the lip of gutter, AC dike, or edge of asphalt.

After conductors have been installed, the ends of conduits terminating in pull boxes, service equipment enclosures, and controller cabinets shall be sealed with an approved type of sealing compound.

After the conduit is backfilled, it shall be mandrelled with a mandrel sized for the conduit. In lieu of the requirements of Section 86-2.05B "Use," of the California Department of Transportation Standard Specifications paragraph 3, the minimum diameter of all conduits shall be 2 inches.

All conduits, new and existing, shall be blown out with compressed air and then sealed for future use.

Conduits terminating in pole bases shall terminate 2 inches below handhole in pole base.

### ***Pull Boxes***

All pull boxes shall be No. 6 unless otherwise noted on the plans. All No. 6 pull boxes shall be poly boxes by Quazite Part No. PG1730BA12 or approved equal.

Grout shall not be placed in the bottom of the pull boxes.

Pull boxes shall be bedded with a 12-inch minimum thickness of clean, crushed rock, the clean, crushed rock shall extend for a minimum of six inches beyond the outside edges of the pull box.

Pull box covers for traffic signals shall be imprinted with "City of Redding Traffic Signal."

### ***Conductors and Wiring***

Splices of conductors shall be insulated with heat-shrink tubing conforming to IAW 86-2.09E of the appropriate size after thoroughly painting the spliced conductors with electrical insulating coating.

Conductors from the terminal compartment through the mast arm to each signal head shall comply with Section 86-2.08 of the California Department of Transportation Standard Specifications.

The minimum insulation thickness, at any point, for Type USE, RHH, or RHW wire shall be 39 mils for conductor sizes No. 14 to No. 10, inclusive, and 51 mils for No. 8 to No. 2, inclusive. The minimum insulation thickness, at any point, for Type THW and TW wires shall be 27 mils for conductor sizes No. 14 to No. 10, inclusive, 40 mils for No. 8, and 52 mils for No. 6 to No. 2, inclusive.

### ***Signal Interconnect Cable***

Signal Interconnect Cable (SIC) shall be the 6-pair type. The pairs to be connected are as follows:

TBO-1 Black	Pair
TBO-2 White	
TBO-3 Green	Pair
TBO-4 Red	

### ***Service***

Continuous welding of exterior seams in service equipment enclosures is not required.

Type III service equipment enclosures shall be the aluminum type.

Circuit breakers shall be the cable-in/cable-out type, mounted on nonenergized clips. All circuit breakers shall be mounted vertically with the up position of the handle being the "ON" position.

Each service shall be provided with up to two main circuit breakers which shall disconnect ungrounded service entrance conductors. Where the "Main" circuit breaker consists of two circuit breakers as shown on the plans or required in the special provisions, each of the circuit breakers shall have a minimum interrupting capacity of 10,000 A, rms.

Minimum conduit size shall be two inch. Service pedestal shall be Tesco Type III AF-21-000 "for City of Redding" or approved equal.

The functional test for each lighting system shall consist of not less than seven days. If unsatisfactory performance of the system develops, the conditions shall be corrected and the

test shall be repeated until the seven days of continuous, satisfactory operation is obtained. The functional test for grounds shall be conducted with a 3-point ground tester.

### **2070L Controller Assemblies**

Model 2070 Controller assemblies shall be furnished by the Contractor.

The controller shall be a Naztec Model 2070L with Apogee Version 65 NTCIP based Intersection Control Software by Naztec, and conforming to the following specifications:

The controller shall be the "lite" version Model 2070L (Caltrans Rack Mount type) ATC traffic controller per California Department of Transportation's (Caltrans) specification, shall conform to the Transportation Electrical Equipment Specifications (TEES) Errata 2, and shall be listed on the Caltrans Qualified Products List (QPL). The controller shall be equipped with the following modules:

2070-1B	8Mb-CPU with Ethernet Port
2070-2A	I/O Module for 332 cabinets
2070-3B	8x40 Line Display
2070-4B	Power Supply
2070-6B	Modem
2070-7A	Dual Serial Port Card

- **2070-1B**

The 2070-1B shall be 8Mb and equipped with an Ethernet port. The controller software operating on the 2070-1B shall be capable of utilizing the Ethernet port for data transfers. The operating system shall allow the user FTP and Telnet access via the Ethernet port.

- **2070-7A**

The 2070-7A shall conform to the latest TEES specification. The 2070-7A shall be optically isolated and capable of asynchronous serial communication for ports C215 and C225. On-board jumpers shall be provided to allow either DCE or DTE operation for each port.

- **Operating System**

The 2070 controller shall operate on the 2070-1B using Microware OS9 v3.2 or higher

- **Intersection Software**

The controller software shall include the latest version of "Apogee" v65 NTCIP-based Intersection Control Software by Naztec Inc.

- **Testing**

Prior to delivery, each controller assembly shall be configured and tested by the supplier. The controller shall be "plug and play" ready for the City's existing 332 and 336 cabinets.

- **Installation and Training**

A factory certified representative for the manufacturer shall be on-site during signal turn-on for support.

The supplier shall provide a minimum of two hours of technical training for City staff within four weeks after controller delivery.

- **Warranty**

The controller assembly shall be warranted by the manufacturer against mechanical and electrical defects for a period of 1 year.

The supplier shall correct any defects in design, workmanship or material during the warranty period at no cost to the City of Redding. All cost of labor, parts and transportation shall be borne by the supplier for the duration of the warranty period.

The vendor shall provide all standard revisions to any equipment furnished under these specifications, at no cost to the City of Redding.

### **Contractor Furnished Controller Assemblies**

The Model 2070 controller assemblies, including 2070 controller unit, completely wired controller cabinet and inductive loop or video detector sensor units, with anchor bolts, will be Contractor furnished.

The Contractor shall construct each controller cabinet foundation as shown on the plans for Model 332 and 336 cabinets (including furnishing and installing anchor bolts), shall install the controller cabinet on the foundation, and shall make field wiring connections to the terminal blocks in the controller cabinet.

A listing of field conductor terminations, in each controller cabinet, will be furnished to the Engineer prior to installation.

City forces will maintain controller assemblies.

Controller assemblies shall be delivered to the City of Redding signal shop a minimum of thirty (30) days prior to installation for testing.

### **Cabinet Wiring - General**

No solid wire will have crimp on lugs unless approved by the manufacturer of the solderless terminals.

Crimp style connectors shall be insulated ring type. Manufacturer's instructions shall be followed for crimping wire. Crimping tool shall comply with Section 86-3.04C "Cabinet Wiring"

of the California Department of Transportation Standard Specifications. Wire shall extend through crimp barrel 32 mils. All detector wiring shall be soldered at termination point.

All field wiring in the cabinet shall go directly to its terminal point. Wire shall be neatly wrapped and held together with clinch type nylon cable straps.

All wiring shall be securely tagged with nylon ID bands of the clinch type near the termination point. Detector wiring shall be marked with phase, file, slot number, and channel. Signal wiring shall be marked with phase number. Pedestrian wiring shall be marked with phase number and "PED."

Cable sheath shall extend past the end of the conduit in 332 cabinet by 2 inches. Heat shrink shall be applied to each cable. Each end of the heat shrink tube, after contraction, shall overlap the conductor insulation at least 1.5 inches. Heat shrink shall meet the California Department of Transportation Standard Specifications.

### ***Cabinet Accessories***

Contractor shall supply the following:

1. Tripp-Lite 1200 Line Filter, or approved equal, with each cabinet.
2. Plan Drawer in 332 cabinet
3. Optional light in 332 cabinet.
4. Surge Suppression - Innovative Technology Part No. HS-120-10A, or approved equal.
5. Two channel input card for input isolation with ribbon cable in Slot I for fog detection.
6. Monitor
7. Programming device for video detection.

### ***Vehicle Signal Faces and Signal Heads***

LEDs for vehicular traffic signal units will be Contractor furnished.

Type MAS mounting shall utilize Pelco bracket assembly number AS-0125 or approved equal.

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 the same manner shown for bolting the terminal compartment.

Signal section housings shall be the poly carbonate type.

Only tunnel visors shall be used. Pipe fittings shall be ductile iron, galvanized steel, or bronze. Aluminum fittings shall not be used.

Back plates shall be the louvered type.

Drain holes, 1/4-inch in diameter, shall be drilled in the bottom of signal heads.

Signal housings, visors, and back plates shall be black.

### ***Light Emitting Diode Signal Modules***

For traffic signal faces, all sections, including all 12-inch sections, all 8-inch sections, all arrow sections, and all pedestrian "Walk" and "Don't Walk" symbols shall utilize light emitting diode (LED) signal modules.

Contractor shall install LED lights in all display indications per the Section 86-4.02 of the California Department of Transportation Standard Specifications and special provisions. LED lights shall be Dialight "Duraled" Model:

<b>12-inch Ball</b>	<b>12-inch Arrow</b>	<b>Ped Module</b>
Red-433-1210-003	Red-432-1314-001	430-6473-001
Yel-433-3230-001	Yel-431-3334-001	
Green-433-2220-001	Green-432-2324-001	

### ***Pedestrian Signals***

Audible pedestrian signals shall be installed with all pedestrian signal heads. Audible signals shall consist of a Cuckoo for North/South and a Peep-Peep for East/West. Audible signals shall operate concurrently with walk phase of pedestrian signal. Audible signals shall be as furnished by Novax, Model APS or approved equal. The sound level shall be externally adjustable. Drain holes, 1/4-inch in diameter shall be drilled in the bottom of pedestrian heads.

### ***LED (Light Emitting Diode) Countdown Pedestrian Signal Module***

LED (Light Emitting Diode) countdown pedestrian signal module shall be Contractor furnished and shall be Dialight Corporation, Model 430-6479-001X or approved equal.

Dialight Corporation, Model 430-6479-001X countdown pedestrian signal module shall conform to the following specifications.

#### General

The pedestrian signal indication of the module shall be supplied with a combination message "UPRAISED HAND" and "WALKING PERSON" symbol, that complies with PTCSI (Pedestrian Traffic Control Signal Indications) standard for these symbols for a message-bearing surface of the size specified. Signal indications shall also include numerical countdown display numbers 00 to 99. The numerical countdown display shall have 2 columns of LED's and a minimum height of 7 inches. The LED Countdown Pedestrian signal module shall display a solid Portland orange hand and lunar white person. The Countdown Pedestrian signal shall be located adjacent to the associated "UPRAISED HAND" pedestrian signal head indication. The numerical countdown display shall have 2 digital rows of LED's and a minimum height of 7 inches. The digital illuminated timer will count down the time starting with the beginning of flashing don't walk interval. The timer will go to zero at the beginning of the yellow phase, and shall be dark during the walk and additional clearance intervals prior to the conflicting vehicular phase and during any other phase sequence. If the pedestrian change interval is interrupted

or shortened as part of transition into pre-emption sequence, the countdown pedestrian signal display shall be discontinued and go dark immediately upon activation of the pre-emption transition. The modules shall use light emitting diodes as the light source in conformance with Section 86-4.07 of the California Department of Transportation Standard Specification for LED pedestrian signal modules (combination pedestrian signal) and these specifications. Outlined shapes shall not be accepted.

LED Countdown Pedestrian Signal Modules shall conform to the following:

- Manual on Uniform Traffic Control Devices (MUTCD).
- Applicable provisions of the current specification of the Institute of Transportation Engineering (ITE) standard titled Vehicle Traffic Control Signal Heads – Chapter 2: Light Emitting Diode(LED) Vehicle Traffic Signals Modules (VTCSH Part 2).
- ITE PTCSI-2 LED Compliant.
- Current specification of the Institute of Transportation Engineering (ITE) Standard titled Pedestrian Traffic Control Signal Indications (PTCSI).

### Construction

The LED Countdown Combination Pedestrian signal face module shall be designed to mount behind or replace the existing face plate of existing Type "A" housing as specified by the requirements in the ITE Publication: Equipment and Material Standards, Chapter 3 (Pedestrian Traffic Control Signal Indications).

The LED Countdown Pedestrian Signal module shall be a single, self-contained device, not requiring on-site assembly for installation into Type "A" housing. The power supply for the module shall be integral to the unit.

The circuit board and power supply shall be contained inside the module. Circuit boards shall conform to Chapter 1, Section 6 of the "Transportation Electrical Equipment Specifications" (TEES) per Section 86-4.07 of the California Department of Transportation Standard Specifications.

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

### Materials

Material used for the lens and signal module construction shall conform to ASTM specifications for the materials.

Enclosures containing either the power supply or electronic components of the signal module shall be made of UL94VO flame retardant materials per Section 86-4.07A of the California Department of Transportation Standard Specifications. The lens of the signal module is excluded from this requirement

### Module Identification

Each module shall have the manufacturer's name, trademark, model number, serial number, date of manufacture (month-year), and lot number as identification permanently marked on the back of the module.

The rated voltage and rated power in Watts and Volt-Ampere shall be permanently marked on the back of the module.

If a specific mounting orientation is required, each module shall have prominent and permanent marking(s) for correct indexing and orientation within a signal housing. The markings shall consist of an up arrow, or the word "UP" or "TOP".

### Electrical

Maximum power consumption requirements for the modules are as follows (in Watts):

PSF Module	Power Consumption @ 77°F	Power Consumption @ 165°F
Upraised Hand	10.0 Watts	12.0 Watts
Walking Person	9.0 Watts	12.0 Watts
Count-Down Display	6.0 Watts	8.0 Watts

LED Countdown Pedestrian Signal modules will have EPA (Environmental Protection Agency) Energy Star compliance ratings, if applicable to that shape, size and color.

### Operation Voltage

The modules shall operate from a 60 HZ  $\pm$ 3 HZ AC line over a voltage ranging from 95 volts to 135 volts. The fluctuations of line voltage shall have no visible effect on the luminous intensity of the indications.

Operating voltage of the modules shall be 120 VAC. All parameters shall be measured at this voltage.

The LED Countdown Pedestrian signal module shall have a power factor of 0.90 or greater.

Total harmonic distortion (current and voltage) induced into an AC power line by a LED signal module shall not exceed 20 percent.

The Countdown Pedestrian Signal module on-board circuitry shall include voltage surge protection to withstand high-repetition noise transients as stated in Section 2.1.6 of NEMA Standard TS-2, 1992.

The LED circuitry shall prevent perceptible flicker to the unaided eye over the voltage range specified above.

All wiring and terminal blocks shall meet the requirements of Section 13.02 of ITE Publication: Equipment and Material Standards, Chapter 2 (Vehicle Traffic Control Signal Heads).

The modules shall be operationally compatible with currently used controller assemblies (solid state load switches, flashers, and conflict monitors).

When a current of 20 mA AC (or less) is applied to the unit, the voltage read across the two leads shall be 15 VAC or less.

The modules and associated on-board circuitry must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.

The LEDs shall be wired in series parallel strings. The failure of any one LED, and its associated string of LEDs, shall not cause the loss of more than 5 percent of the light output of the complete LED module.

Transient voltage suppression/protection shall be provided internal to the LED module to minimize the possibility of damage due to extreme over voltage.

The LED countdown combination pedestrian signal module shall be operationally compatible with current 170/2070 type controllers.

The LED module shall be supplied with three conductors three (3) feet in length for each connection to the terminal board of the traffic signal indication. Each conductor shall be 600 volt, stranded No. 20 AWG minimum copper wire, rated for service at +220°F, capable of withstanding all adverse effects of moisture, corrosive atmosphere and temperatures associated with the operation of the signal head. Spade lugs shall be installed on the ends of each conductor.

The LED module shall be capable of automatically setting the countdown timer by summing flashing don't walk time received from the controller and the load switches.

The height of each symbol on the module shall be not less than 10 inches and the width of each symbol on the module shall not be less than 6½ inches.

#### Environmental Requirements

LEDs shall utilize appropriate technology to achieve the required color and shall be the ultra bright type rated for 100,000 hours of continuous operation from -40°F to +165°F.

AllInGaP (Aluminum Indium Gallium Phosphorus), Portland Orange (amber hand and countdown numbers) LEDs shall be utilized. The substrate material may be transparent. The lunar white LEDs (walking person) shall be InGaN (Indium Gallium Nitride). UV Stabilized poly carbonate outer shell The LED pedestrian countdown signal modules, when properly installed with gasket, shall be protected against dust and moisture intrusion per requirements of NEMA Standard 250-1991, sections 4.7.2.1 and 4.7.3.2, for Type 4 enclosures to protect all internal LED, electronic, and electrical components.

## Luminous Intensity

Pedestrian countdown LED signal modules shall be designed to operate over the specified ambient temperature and voltage range, attract the attention of, and be readable by, a viewer (both day and night) at all distances from 3 feet to the full width of the area to be crossed.

The luminous intensity of the LED pedestrian countdown signal module shall not vary more than  $\pm 10$  percent for voltage range of 95 VAC to 135 VAC.

## Photometric Requirements

Each module shall provide a minimum luminous intensity of at least 1,100 foot-lamberts for the Upraised Hand symbol and 1,550 foot-lamberts for the Walking Person symbol. The "Countdown" symbol should be 2-rowed LED's. All symbols shall maintain their intensity throughout the useful life over the operating temperature range.

The uniformity ratio of an illuminated symbol shall not exceed 4 to 1, between the highest luminance area and the lowest luminance area in the module.

The color output of the module shall conform to the requirements of Section 5.3 in the ITE Publication: Equipment and Material Standards, Chapter 3 (Pedestrian Traffic Control Signal Indications).

"Hand" shall be Portland orange not greater than 0.390, nor less than 0.331, nor less than 0.997 – x

"Walking person" shall be lunar white.

x: not less than 0.290, nor greater than 0.330

y: not less than  $1.5x - 0.175$ , nor greater than  $1.5x - 0.130$

"Countdown" display shall be Portland orange

## Functions

### Basic Operation

The control and regulation module shall be of the "smart" type in order for the countdown displays to be automatically adjusted with the programmed intervals of the traffic controller.

### Operating Mode

Clearance Cycle Countdown Mode – The display of the number of remaining seconds shall begin only at the beginning of the pedestrian change interval. The module will start counting when the flashing clearance signal turns on and will countdown to "0" and turn off when the steady "Don't Walk" signal turns on.

## Instruction and Guarantees

Upon request, one schematic wiring diagram and installation manual shall be provided with each LED Countdown Pedestrian Signal module.

No changes or substitutions in these requirements will be accepted unless authorized in writing.

If an LED Countdown Pedestrian Signal module fails to function as intended due to workmanship material defects within the first 60 months from the date of installation, the Contractor shall replace the module at the Contractor's expense.

PSF (Pedestrian Signal Modules) LED modules shall be manufactured in conformance with a vendor quality assurance (QA) program. The QA program shall include design and production. Production quality assurance shall include statistically controlled routine tests to ensure minimum performance levels of PSF LED signal modules built to meet these specifications.

The manufacturer shall have a documented problem resolutions process. Documentation of the QA process test results and problem resolution records shall be kept on file for a minimum period of five years.

PSF LED module components and subassemblies, that may affect reliability or performance, shall be traceable to the original manufacturers.

#### Production Quality Assurance Testing

Production quality assurance testing shall be performed on each PSF LED module. Failure to conform to the requirements of a production quality test shall be cause for rejection. The manufacturer shall retain test results for five years for warranty purposes.

Specified parameters may be measured and used for quality comparison of production modules (rated power, etc.).

PSF LED modules shall be tested for specified initial intensity after burn-in. The burn-in period shall consist of signal modules being energized at rated voltage for a 30 minute stabilization period before the measurements are made. A single point measurement with a correlation to the minimum initial luminous intensity requirements in "Photometric Requirements" of these special provisions for circular modules may be used. The ambient temperature for this measurement shall be +77°F.

PSF LED modules shall be tested for luminous intensity requirements in "Photometric Requirements" of these special provisions.

PSF LED modules shall be tested for required power factor after burn-in.

PSF LED modules shall be tested by measuring current flow in amperes after burn-in. The measured current values shall be compared against current values resulting from design qualification measurements. The current flow shall not exceed the specified value. The measured ampere values with rated voltage shall be recorded as volt-ampere on the product labels.

PSF LED modules shall be visually inspected for exterior physical damage or assembly anomalies. The surface of the lens shall be free of scratches, abrasions, cracks, chips, discoloration, or other defects. Defects shall be cause for rejection.

#### Certificate of Compliance

The Contractor shall provide the Engineer a Certificate of Compliance from the manufacturer, in conformance with the provisions of Section 6-1.07, "Certificates of Compliance," of the Caltrans Standard Specifications. The certificate shall certify that the PSF LED modules comply with the

requirements of these specifications. The certificate shall also include a copy of applicable test reports on the PSF modules.

#### Quality Assurance Testing

PSF LED modules shall be tested in conformance with California Test 610 bulk. Optical testing will be performed with the module mounted in Type A housing. All parameters of the specification may be tested.

#### Warranty

The manufacturer shall provide a written warranty against defects in materials and workmanship for the PSF LED modules for a period of 60 months after installation of the PSF LED modules. Replacement PSF LED modules shall be provided within 5 days after receipt of failed PSF modules at no cost to the City. All warranty documentation shall be given to the Engineer prior to installation. Replacement PSF LED modules shall be delivered to the City of Redding Electrical Shop at 20056 Viking Way, Building 3, Redding, CA 96050.

#### ***Luminaires***

Ballasts shall be the lag or lead regulator type.

#### ***Internally Illuminated Street Name Signs***

Internally illuminated street name signs shall be Type A with 8-inch U.C. and 6-inch L.C. Clearview letters. Signs shall have white letters on a green background. Modify with LED light engine by Relume or approved equal.

Internally illuminated street name signs shall be mounted in accordance with Pelco assembly sheet SE-5149 or approved equal.

#### ***Photoelectric Controls***

Contactors shall be the mechanical armature type.

Photoelectric controls shall be located in the control cabinet.

#### ***Detectors***

When loop detector sensor units are called for on the plans, the sensor units will be Contractor furnished. Detector sensor units shall be Reno A & E, Type C, rack mount for 2070 system, 2-Channel, or approved equal, including present and historical fault indicator discriminating between open loop, shorted loop, and sudden changes in loop inductance.

Loop wire shall be Type 2 per Section 86-5.01A(4) of California Department of Transportation Standard Specifications.

Loop detector lead-in cable shall be Type B per Section 86-5.01A(4) of California Department of Transportation Standard Specifications.

Slots shall be filled with hot-melt rubberized asphalt sealant.

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

### ***Pedestrian Push Buttons***

Pedestrian push buttons shall be Polara Engineering, Inc., Bulldog (Momentray LED Model), Model BDL M2, or approved equal. Push button color shall be black.

### ***Video Vehicle Detection***

Video vehicle detection system shall be Autoscope Solo Terra or approved equal.

### ***Video Detection - General***

The detection of vehicles passing through the field-of-view of an image sensor shall be made available to a large variety of end user applications as simple contact closure outputs that reflect the current real-time detector or alarm states (on/off) or as summary traffic statistics that are reported locally or remotely. The contact closure outputs shall be provided to a traffic signal controller and comply with the 2070 input file rack standards.

The system architecture shall fully support networking of system components through a variety of industry standard and commercially available infrastructures that are used in the traffic industry. The data communications shall support direct connect, and multi-drop interconnects. Simple, standard wiring shall be supported to minimize overall system cost and improve reliability, utilizing existing infrastructure and ease of system installation and maintenance. Both streaming video and data communications shall be interconnected over long distances through fiber optic, microwave, or other commonly used digital communications transport configurations.

The software application system shall be integrated through a client-server relationship. A communications server application shall provide the data communications interface between Machine Vision Processor (MVP) sensors and client applications. The client applications shall either be hosted on the same PC as the communications server or may be distributed over a local area network of PC's using the industry standard TCP/IP network protocol. Multiple client applications shall execute simultaneously on the same host or multiple hosts, depending on the network configuration. Additionally, a web-browser interface shall allow use of industry standard Internet web browsers to connect to MVP sensors for setup, maintenance, and playing digital streaming video.

### ***System Hardware***

The machine vision system hardware shall consist of three components: 1) a color, 22x zoom, MVP sensor 2) a modular cabinet interface unit 3) a communication interface panel. Additionally, a personal computer (PC) shall host the server and client applications that are used to program and monitor the system components. The real-time performance shall be observed by viewing the video output from the sensor with overlaid flashing detectors to indicate the current detection state (on/off). The MVP sensor shall store cumulative traffic statistics internally in non-volatile memory for later retrieval and analysis.

The MVP shall communicate to the modular cabinet interface unit via the communications interface panel and the software applications using the industry standard TCP/IP network protocol. The MVP shall have a built-in, Internet Protocol (IP) address and shall be addressable with no plug in devices or converters required. The MVP shall provide standard MPEG-4 streaming digital video. Achievable frame rates shall vary from 5 to 30 frames/sec as a function of video quality and available bandwidth.

The modular cabinet interface unit shall communicate directly with up to eight (8) MVP sensors and shall comply with the form factor and electrical characteristics to plug directly into a 2070 input file rack providing up to sixteen (16) contact closure inputs and twenty-four (24) contact closure outputs to a traffic signal controller.

The communication interface panel shall provide four (4) sets of three (3) electrical terminations for three-wire power cables for up to eight (8) MVP sensors that may be mounted on a pole or mast arm with a traffic signal cabinet or junction box. The communication interface panel shall provide high-energy transient protection to electrically protect the modular cabinet interface unit and connected MVP sensors. The communications interface panel shall provide single-point connectivity via RJ45 connector for communication to and between the modular cabinet interface module and the MVP sensors.

### **System Software**

The MVP sensor embedded software shall incorporate applications that perform a variety of diagnostic, installation, fault tolerant operations, data communications, digital video streaming, and vehicle detection processing. The detection shall be reliable, consistent, and perform under all weather, lighting, and traffic congestion levels. An embedded web server shall permit standard internet browsers to connect and perform basic configuration, maintenance, and video streaming services.

There shall be a suite of client applications that reside on the host client / server PC. The applications shall execute under Microsoft Windows XP or Vista. Available client applications shall include:

- Master network browser: Learn a network of connected modular cabinet interface units and MVP sensors, display basic information, and launch applications software to perform operations within that system of sensors.
- Configuration setup: Create and modify detector configurations to be executed on the MVP sensor and the modular cabinet interface unit.
- Operation log: Retrieve, display, and save field hardware run-time operation logs of special events that have occurred.
- Software install: Reconfigure one or more MVP sensors with a newer release of embedded system software.
- Streaming video player: Play and record streaming video with flashing detector overlay.
- Data retrieval: Fetch once or poll for traffic data and alarms and store on PC storage media.

- Communications server: Provide fault-tolerant, real-time TCP/IP communications to / from all devices and client applications with full logging capability for systems integration.

## ***Functional Capabilities***

### ***MVP Sensor***

The MVP sensor shall be an integrated imaging color Charge-Coupled Device (CCD) array with zoom lens optics, high-speed, dual-core image processing hardware bundled into a sealed enclosure. The CCD array shall be directly controlled by the dual-core processor. It shall be possible to zoom the lens as required for setup and operation. It shall provide JPEG video compression as well as standard MPEG-4 digital streaming video with flashing detector overlay. The MVP shall provide direct real-time iris and shutter speed control. The MVP image sensor shall be equipped with an integrated 22x zoom lens that can be changed using either configuration computer software. The digital streaming video output and all data communications shall be transmitted over the three-wire power cable.

### ***Power***

The MVP sensor shall operate on 110/220 VAC, 50/60Hz at a maximum of 25 watts. The camera and processor electronics shall consume a maximum of 10 watts and the remaining 15 watts shall support an enclosure heater.

### ***Detection Zone Programming***

Placement of detection zones shall be by means of a PC with a Windows XP or Vista operating system, a keyboard, and a mouse. The PC monitor shall be able to show the detection zones superimposed on images of traffic scenes.

The detection zones shall be created by using a mouse to draw detection zones on the PC monitor. Using the mouse and keyboard it shall be possible to place, size, and orient detection zones to provide optimal road coverage for vehicle detection. It shall be possible to download detector configurations from the PC to the MVP sensor and cabinet interface module, to retrieve the detector configuration that is currently running in the MVP sensor, and to back up detector configurations by saving them to the PC fixed disks or other removable storage media.

The supervisor computer's mouse and keyboard shall be used to edit previously defined detector configurations to permit adjustment of the detection zone size and placement, to add detectors for additional traffic applications, or to reprogram the MVP sensor for different traffic applications or changes in installation site geometry or traffic rerouting.

### ***Optimal Detection***

The video detection system shall optimally detect vehicle passage and presence when the MVP sensor is mounted 30 feet (10 m) or higher above the roadway, when the image sensor is adjacent to the desired coverage area, and when the distance to the farthest detection zone locations are not greater than ten (10) times the mounting height of the MVP. The recommended deployment geometry for optimal detection also requires that there be an unobstructed view of each traveled lane where detection is required. Although optimal detection may be obtained when the MVP is mounted directly above the traveled lanes, the

MVP shall not be required to be directly over the roadway. The MVP shall be able to view either approaching or receding traffic or both in the same field of view. The MVP sensor placed at a mounting height that minimizes vehicle image occlusion shall be able to simultaneously monitor a maximum of six (6) traffic lanes when mounted at the road-side or up to eight (8) traffic lanes when mounted in the center with four lanes on each side.

### ***Modular Cabinet Interface Unit***

The modular cabinet interface unit shall provide the hardware and software means for up to eight (8) MVP sensors to communicate real-time detection states and alarms to a local traffic signal controller. It shall comply with the electrical and protocol specifications of the detector rack standards. The card shall have 1500 Vrms isolation between rack logic ground and street wiring.

The modular cabinet interface unit shall be a simple interface card that plugs directly into a 2070 input file rack. The modular cabinet interface unit shall occupy only 2 slots of the detector rack. The modular cabinet interface unit shall accept up to sixteen (16) phase inputs and shall provide up to twenty-four (24) detector outputs.

### ***Communications Interface Panel***

The communications interface panel shall support up to eight MVPs. The communications interface panel shall accept 110/220 VAC, 50/60 Hz power and provide predefined wire termination blocks for MVP power connections, a Broadband-over-Power-Line (BPL) transceiver to support up to 10MB/s interdevice communications, electrical surge protectors to isolate the modular cabinet interface unit and MVP sensors, and an interface connector to cable directly to the modular cabinet interface unit.

The interface panel shall provide power for up to eight (8) MVP sensors, taking local line voltage 110/220 VAC, 50/60 Hz and producing 110/220 VAC, 50/60 Hz, at about 30 watts to each MVP sensor. Two ½-amp SLO-BLO fuses shall protect the communications interface panel.

### ***System Installation & Training***

A certified representative of the video image processor equipment shall be available to supervise the installation and set-up of the equipment upon five days notice. The certified representative shall perform the initial set-up and train selected personnel from the agency to perform that set-up. Three sets of all documentation necessary to maintain and operate the system shall be provided at time of installation and training.

### ***Warranty, Service, & Support***

The video detection system shall be warranted for a minimum of two (2) years. Ongoing software support shall include software updates of the MVP sensor, modular cabinet interface unit, and supervisor computer applications. These updates shall be provided at no cost to the City during the warranty period. The supplier shall maintain a program for technical support and software updates following expiration of the warranty period. This program shall be available to the City in the form of a separate agreement for continuing support.

## ***Operational Requirement***

Operational requirements shall include a programmable time out function which enables the video input processor unit to reenter the LEARN mode and thereby adapt to environmental corrections.

A computer shall not be required for system set up or modification. No modification of the 2070 style cabinets shall be permitted. Existing input files shall be used to house the (video vehicle detector) video input processor. The use of external card cages or EIA Racks shall not be allowed.

A time out function shall be provided to disallow continuous call activation without going back to the LEARN mode.

Each of eight probes may have a different output type, including detection on entry, detection on exit, or presence detection, delayed detection and extended mode. Pulse width may be selected. A minimum level of quality is setable outside of which a time out causes selectable recall conditions.

In standard mode, the type of detector and the name of the system shall appear on the screen with the outline of the detection zone. The quality level shall be displayed on the screen. Detection will begin in a time not to exceed eight seconds after entering the learn mode. A counter on the screen must show the number of detected vehicles.

The data stored in memory from the LEARN mode will be retrieved and used during the OPERATA mode.

An analog signal (video input) shall include text and presentation of results via the video out and must be in real (30 frames per second) time. A fail-safe relay shall be selectable internally from the program software.

### **1. Software Specifications for Video Image Processor (VIP)**

- Two cameras input.
- Twenty-four digital outputs.
- Twenty digital inputs.
- Fits directly into the 2070 and NEMA rack without an additional adapter.
- Twenty-four direction sensible detector probes per camera, including up to six counting probes per camera.
- Stores counts for 4,000 intervals.
- Detection results of all detection probes can be combined with the inputs to the related outputs. AND, OR, NOT
- Four configurations stored on board.
- Modifications with no interruption on all probes.
- Setup via keypad and monitor (no pointing device needed).
- Software update via RS232.

The video detection board will have only four outputs and will use expansion boards for additional input and output. The video detection (main) board will have the following on its front:

- One Male DB9 for connection with the first expansion board.
- One Female DB9 for setup with keypad (service port).
- LEDs for outputs on board (two for Camera No. 1 and two for Camera No. 2), power, Video Cam 1 and Video Cam 2, communications with expansions.
- One video output for setup via keyboard.
- A switch to select which image to be on the service output.

The input/output expansion board will have the following on its front:

- LEDs for power, expansion communication, input/output activity.
- Two DB9 ports for communication with master or other expansion boards.
- An 8-dipswitch device to select the input/output, Range 1-12 or 13-24, and input/output number (see example for more information).

## 2. PIN usage on 2070

A. Video Detection (main) Board - The master is two slots wide. There are four outputs free selectable over the two cameras. The master cannot have inputs. The master DB9 connector is to be connected to the first slave (exp comm IN). The first slave (exp comm OUT) is then connected to the second one. DB9 means you can use flat or round cables.

B. Input/Output Expansion Board - The slave card is only one slot wide. You can use two or four inputs/outputs. Using the dipswitches, one can select which output (defined in the VIP3) will be connected on the expansion board.

### ***Modular (Single Camera) Detector Rack Mounted Video Detection System***

#### ***General***

This specification sets forth the minimum requirements for a system that detects vehicles on a roadway using only video images of vehicle traffic.

#### ***System Hardware***

The video detection system shall consist of one video camera, a video image processor (VIP) which mounts in a standard detector rack; a detector rack mounted extension module (EM) and a pointed device. Video camera power shall be wired to the 332 electrical system main terminal block(s) and fused as follows:

<b><i>Weidmuller Fuse &amp; Grounding Block Part Numbers</i></b>		
<b><i>Item</i></b>	<b><i>Description</i></b>	<b><i>Part Number</i></b>
End Plate	WAP(1.5)	10500
Fuse Block	WSI 6/2	101400
End Bracket	WEW 35/2	106120
Jumper (Fuse Block)	QL 4	47090

Jumper Screw	BSM 3X5	105210
Rail	TS 35	67620
Feed Thru	WDU 6	102020

Provide video detection surge suppression using EDCO CX06-BNCY surge suppressors or approved equal.

### ***System Software***

The system shall include software that detects vehicles in multiple lanes using only the video image. Detection zones shall be defined using only an on board video menu and a pointing device to place the zones on a video image. Up to 24 detection zones per camera shall be available. A separate computer shall **not** be required to program the detection zones.

### ***Functional Capabilities***

The VIP shall process video from one source. The source can be a video camera or video tape player. The video shall be input to the VIP in RS170 format and shall be digitized and analyzed in real time.

The VIP shall detect the presence of vehicles in up to 24 detection zones per camera. A detection zone shall be approximately the width and length of one car.

Detector zones shall be programmed via an on board menu displayed on a user supplied video monitor and using a pointing device connected to the VIP. The menu shall facilitate placement of the detection zones quickly and easily.

The VIP shall store up to three different detector zone patterns. The VIP can switch to any one of the three different detector patterns within one second of user request via menu selection with the pointing device.

The VIP shall detect vehicles in real time as they travel across each detector zone.

The Extensions Module (EM) shall be available to avoid the need of rewiring the detector rack, by enabling the user to plug an extension module into the appropriate slot in the detector rack. The extension module shall be connected to the VIP by a 10-wire cable with modular connectors, and shall output contact closures in accordance with use selectable channel assignments.

### ***Vehicle Detection***

A minimum of 24 detection zones shall be supported and each detection zone can be sized to suit the site and the desired vehicle detection region.

A single detection zone shall be able to replace multiple inductive loops and the detection zone shall be ORed as the default or may be ANDed together to draw the detection zones on the video image from the video camera.

A minimum of three detection zone patterns shall be saved within the VIP memory. The VIP's memory shall be nonvolatile to prevent data loss during power outages.

The selection of the detection zone pattern for current use shall be done through a menu. It shall be possible to activate a detection zone pattern for a camera from VIP memory and have that detection zone pattern displayed within one second of activation.

When a vehicle is detected crossing a detection zone, the corners of the detection zone will flash on the video overlay display screen to confirm the detection of the vehicle.

Detection shall be at least 98 percent accurate in good weather conditions and at least 96 percent accurate under adverse weather conditions (rain, snow, or fog). Detection accuracy is dependent upon site geometry; camera placement, camera quality and detection zone location, and these accuracy levels do not include allowances for occlusion or poor video due to camera location or quality. **See section 5.11 for recommended camera placement.**

Detector placement shall not be more distant from the camera than a distance of ten times the mounting height of the camera.

The VIP shall provide up to eight channels of vehicle presence detection through a standard detector rack edge connector edge connector and one or more extension modules.

The VIP shall provide Dynamic Zone Reconfiguration (DZR) to enable normal detector operation of existing channels except the one where a zone is being added or modified during the setup process. The VIP shall output a constant call on any detection channel corresponding to a zone being modified.

Detection zone setup shall not require site specific information such as latitude, longitude, date, and time to be entered into the system.

The VIP shall output a constant call for each enabled detector output channel if a loss of video signal occurs. The VIP shall output a constant call during the background learning period.

### ***VIP and EM Hardware***

The VIP and EM shall be specifically designed to mount in a standard detector rack, using the edge connector to obtain power and provide contact closure outputs. No adapters shall be required to mount the VIP or EM in a standard detector rack. Detector rack rewiring shall not be required or shall be minimized.

The VIP and EM shall operate satisfactorily in a temperature range from -34°C to +74°C and a humidity range from 0 percent RH to 95 percent RH, noncondensing.

The VIP and EM shall be powered by 24 volts dc.

VIP power consumption shall not exceed 450 milliamps. The EM power consumption shall not exceed 100 milliamps.

The VIP shall utilize flash memory technology to enable the loading of modified or enhanced software through the RS232 port without modifying the VIP hardware.

The VIP and EM shall include detector output pin out compatibility with industry standard detector racks.

The front of the VIP shall include one BNC video input connection suitable for RS170 video inputs. The video input shall include a switch selectable 75-ohm or high impedance termination to allow camera video to be routed to other devices, as well as input to the VIP for vehicle detection.

The front of the VIP shall include one BNC video output providing real time video output that can be routed to other devices.

The front panel of the VIP shall have a detector test switch to allow the user to place calls on each channel. The test switch shall be able to place either a constant call or a momentary call depending on the position of the switch.

VIP to be configured by "time-of-day." VIP vendor to provide single input cards only and a 4-channel video selector switch.

### **Camera**

The video camera used for traffic detection shall be furnished by the VIP supplier and shall be qualified by the supplier to ensure proper system operation.

The camera shall produce a useable video image of the bodies of vehicles under all roadway lighting conditions, regardless of time of day. The minimum range of scene luminance over which the camera shall produce a useable video image shall be the minimum range of nighttime to daytime, but not less than the range 0.1 lux to 10,000 lux.

The camera shall use a CCD sensing element and shall output monochrome video with resolution of not less than 380 lines vertical and 380 lines horizontal, at minimum 5 percent Modulation Transfer Function (MTF).

The camera shall include an electronic shutter control lens.

The camera shall include a variable focal length lens with variable focus and zoom that can be adjusted, without opening up the camera housing, to suit the site geometry.

The camera electronics shall include Automatic Gain Controller Circuit (AGC) to produce a satisfactory image at night.

The camera shall be housed in a weather-tight sealed enclosure. The housing shall be field rotatable to allow proper alignment between the camera and the traveled road surface.

The camera enclosure shall be equipped with a sun shield that prevents sunlight from directly entering the lens. The sun shield shall include a provision for water diversion to prevent water from flowing in the camera's field of view. The camera enclosure with sun shield shall be 5 inches diameter or less, 14 inches long or less, and shall weigh 5 pounds or less when the camera and lens are mounted inside the enclosure.

The camera enclosure shall include a thermostatically controlled heater to assure proper operation of the lens shutter at low temperatures and prevent moisture condensation on the optical faceplate of the enclosure.

When mounted outdoors in the enclosure, the camera shall operate satisfactorily in a temperature range from -35°C to +60°C and a humidity range from 0 percent RH to 100 percent RH.

The camera shall be powered by 120 VAC, 60 Hz. Power consumption shall be less than 15 watts under all conditions.

All cameras shall be placed on signal mast arms. Recommended camera placement height shall be over the traveled way on which vehicles are to be detected. All mast arm mounting shall be achieved with a Pelco Astro-Brac 6-foot mount No. AB-0169-5-62-ALO or approved equal. For optimum detection the camera should be centered above the traveled roadway. Camera placement and field of view (FOV) shall be unobstructed and as noted in the installation documentation provided by the supplier.

The camera enclosure shall be equipped with separate, weather-tight connections for power and video cables at the rear of the enclosure. These connections may also allow diagnostic testing and viewing of video at the camera while the camera is installed on a mast arm or poles using a lens adjust module (LAM) supplied by the VIP supplier. Video and power shall not be connected within the same connector.

The video signal output by the camera shall be in RS170 format.

The video signal shall be fully isolated from the camera enclosure and power cabling.

### ***Limited Warranty***

The supplier shall provide a limited warranty that items will, at the time of shipment to the City, conform to suppliers published specifications and be free from defects in material and workmanship. The occurrence of any of the following shall terminate the suppliers limited warranty:

1. The alteration or repair of the items by methods not conforming with suppliers approved procedures.
2. Damage to the items caused by accident, negligence, or any other type of abuse or misuse of items.
3. The removal of serial numbers, or the removal, mutilation, or defacement of any part of the items.
4. Use of the suppliers VIP (processor) with cameras obtained from a source other than supplier.

This is a limited warranty only and shall expire 24 months after the date of shipment of each unit. As a condition to making any claim under this limited warranty, the City must request a return material authorization (RMA) before the limited warranty terminates or expires. Provided

that the limited warranty has not terminated or expired, supplier shall issue the RMA and the City shall have the right to return the nonconforming item to supplier for repair or, at suppliers option, replacement with new or reconditioned materials. Except for repair or replacement, supplier shall not have any other liability to the City. Repair or replaced items have a limited warranty for the greater of 90 days from the time of shipment or the remainder of the original warranty period.

In recognition of the substantial influence on video detection performance exerted by the quality of the physical installation, including section of locations for camera as well as cabling and connector integrity, no warranty of merchantability or fitness for purpose is made for the video detection system. Under no circumstances shall supplier be liable for any loss or damage, whether direct, indirect, special, incidental, or consequential, to the City arising out of the use or inability to use the products.

The foregoing warranties are expressly made in lieu of all warranties expressed or implied and are the sole remedy of user.

During the warranty period, technical support shall be available from the supplier via telephone within four hours of the time a call is made by a user, and this support shall be available from factory-certified personnel or factory-certified installers.

During the warranty period, updates to VIP software shall be available from the supplier at no cost to the City.

### ***Maintenance and Support***

The supplier shall maintain an adequate inventory of parts to support maintenance and repair of the video detection system. These parts shall be available for delivery within 30 days of placement of an acceptable order at the supplier's then current pricing and terms of the sale for said parts.

The supplier shall maintain an ongoing program of technical support for the video detection system. This support shall be available via telephone, or via personnel sent to the installation site upon placement of an acceptable order at the supplier's then current pricing and terms of sale for on site technical support services.

Installation or training support shall be provided by a factory authorized representative.

All product documentation shall be written in the English language.

### ***Camera Specifications***

	<b>North America</b>	<b>International</b>
Signal format	NTSC	PAL
Input	Composite video 1.0Vp-p @ 75 ohms	Composite video 1.0Vp-p @ 75 ohms
Output	Composite video 1.0Vp-p @ 75 ohms	Composite video 1.0Vp-p @ 75 ohms

	North America	International
Power source	89V-135V AC, 60Hz	215V-265V AC, 50Hz
Power consumption	15W	15W
Operating temperature	-31°F to 140°F	-35°C to 60°C
Operating humidity	0% to 100%	0% to 100%
Dimensions	5 in. (width) 5.5 in. (height) 14 in. (depth)	127 mm (width) 140 mm (height) 355.6 mm (depth)
Weight	5.25 lb.	2.38 kg

### **EDCO Video Detection Coax Protection for Balanced Differential Inputs**

Order Part # CXI-05

BNC orientation: out each end, external ground lug and mounting plate

Order Part # RMCXI-05

BNC orientation, both out of the top, external ground lug and mounting plate

Compatible with RM4POS Mounting Plate

Order Part # RM4POS

Four position mounting plate for RMCXI-Series

Accommodates up to 4 RMCXI-05 units

Order Part # RM4POS and (Qty 4) RMCXI-05

Four position mounting plate for RMCXI-Series and 4 RMCXI-05 modules

A certified representative of the video detection system supplier shall be available to advise the Contractor and Engineer concerning proper camera selection and site installation. Upon request, the representative shall be available to supervise the installation of the camera equipment and shall do the initial set-up for the detection zones and testing of the system. The representative shall be present at the time of the equipment turn-on, shall program the system in the field and shall provide suitable training class and cover operations, setup, and maintenance to Caltrans personnel.

All systems and equipment shall be compatible with the Model 2070 controller assemblies. All components of the video detection system, including software, equipment, cables, and hardware, shall be part of an engineered system that is specifically designed by the Video Image Processor/Video Detection Processor manufacturer to fully interoperate with all other video detection system components. The components shall be identified by manufacturer part and model numbers as being fully compatible and recommended for use in the engineered system. The Contractor shall demonstrate that all of the components of each system are compatible and will perform satisfactorily as a system. The Contractor shall furnish 5 sets of equipment lists, operation and maintenance manuals, and wiring diagrams which shall conform to the requirements in Section 86-1.04, "equipment List and Drawings" of the Caltrans' Standard Specification.

In addition to the system requirements shown on the plans, the following Video Vehicle Detection equipment shall be provided to the Engineer.

- Three 1-slot detector/processor cards and cables
- One video camera and mounting, banding material and clamps

### ***Detector Wiring***

Detector wiring shall have heat shrink tubing, sized accordingly and in accordance with Section 86-2.09E "Splice Insulation," of the California Department of Transportation Standard Specifications applied at each splice in the pull box. All splices in the pull box shall be butt spliced and soldered.

Detector wiring in cabinet shall have one inch of heat shrink tubing evenly applied at each breakout.

### ***Loop Conductors***

Conductors for inductive loop traffic signal shall be identified and banded in pairs by phase, slot number, and channel (i.e. 2I2U).

Conductors for inductive loop count stations shall be identified and banded as shown on the plans (i.e. A1 & B1, A2 & B2, etc.).

Terminals in the connector shall be crimped and soldered.

### ***EMERGENCY VEHICLE DETECTOR SYSTEM***

Each traffic signal shall have an emergency vehicle detector system which shall conform to the details shown on the plans and these special provisions. The emergency vehicle detector system shall operate with the City's Opticom system currently in use.

### ***General***

Each emergency vehicle detector system shall consist of an optical emitter assembly or assemblies located on the appropriate vehicle and an optical detector/discriminator assembly or assemblies located at the traffic signal.

Emitter assemblies are not required for this project except units for testing purposes to demonstrate that the systems perform as specified. Tests shall be conducted in the presence of the Engineer as described below under "System Operation" during the signal test period. The Engineer shall be given a minimum of two working days notice prior to performing the tests.

Each system shall permit detection of two classes of authorized vehicles. Class I (Mass transit) vehicles shall be detected at ranges of up to 1,000 feet from the optical detector. Class II (emergency) vehicles shall be detected at ranges up to 1,800 feet from the optical detector.

Class I signals (those emitted by Class I vehicles) shall be distinguished from Class II signals (those emitted by Class II vehicles) on the basis of the modulation frequency of the light from the respective emitter. The modulation frequency for Class I signal emitters shall be  $9.639 \text{ Hz} \pm 0.110 \text{ Hz}$ . The modulation frequency for Class II signal emitters shall be  $14.035 \text{ Hz} \pm 0.250 \text{ Hz}$ .

A system shall establish a priority of Class II vehicle signals over Class I vehicles signals and shall conform to the requirements in Section 25352 of the California Vehicle Code.

## **EMITTER ASSEMBLY**

Each emitter assembly, provided for testing purposes, shall consist of an emitter unit, an emitter control unit, and connecting cables.

### **General**

Each emitter assembly, including lamp, shall operate over an ambient temperature range of -34° C to 60° C at both modulation frequencies and operate continuously at the higher frequency for a minimum of 3,000 hours at 25° C ambient before failure of the lamp or other components.

Each emitter unit shall be controlled by a single, maintained-contact switch on the respective emitter control unit. The switch shall be located to be readily accessible to the vehicle driver. The control unit shall contain a pilot light to indicate that the emitter power circuit is energized and shall generate only one modulating code, either that for Class I vehicles or that for Class II vehicles.

The Contractor shall provide the Engineer with 10 emitter assemblies capable of being detected by Tomar or 3M detector coded systems.

### **Functional**

Each emitter unit shall transmit optical energy in one direction only.

The signal from each Class I signal emitter unit shall be detectable at a distance of 1,000 feet when used with a standard optical detection/discriminator assembly and filter to eliminate visible light. Visible light shall be considered eliminated when the output of the emitter unit with the filter is 380 nm to 750 nm when measured at a distance of 3 m. A Certificate of Compliance, conforming to the requirements in Section 6-1.07, "Certificates of Compliance," of the California Department of Transportation Standard Specifications shall be submitted to the Engineer with each Class I emitter unit.

The signal from each Class II Signal emitter unit shall be detectable at a distance of 1,800 feet when used with a standard optical detection/discriminator assembly.

The standard optical detection/discriminator assembly to be used in making the range tests shall be available from the manufacturer of the system. A certified performance report shall be furnished with each assembly.

### **Electrical**

Each emitter assembly shall provide full light output with input voltages of between 12.5 V (dc) and 17.5 V (dc). An emitter assembly shall not be damaged by input voltages up to 7.5 V (dc) above supply voltage. The emitter assembly shall not generate voltage transients, on the input supply, which exceed the supply voltage by more than 4 volts.

Each emitter assembly shall consume not more than 100 W at 17.5 V (dc) and shall have a power input circuit breaker rated at 10 A to 12 A, 12 V (dc).

The design and circuitry of each emitter shall permit its use on vehicles with either negative or positive ground without disassembling or rewiring of the unit.

### ***Mechanical***

Each emitter unit shall be housed in a weatherproof corrosion-resistant housing. The housing shall be provided with facilities to permit mounting on various types of vehicles and shall have provision for aligning the emitter unit properly and for locking the emitter unit into this alignment.

Each emitter control unit shall be provided with hardware to permit the unit to be mounted in or on an emergency vehicle or mass transit vehicle. Where required for certain emergency vehicles, the emitter control unit and exposed controls shall be weatherproof.

## ***OPTICAL DETECTION/DISCRIMINATOR ASSEMBLY***

### ***General***

Each optical detector shall be a waterproof unit.

Each assembly, when used with standard emitters, shall have a range of at least 1,000 feet for Class I signals and 1,800 feet for Class II signals. Standard emitters for both classes of signals shall be available from the manufacturer of the system. Range measurements shall be taken with all range adjustments on the discriminator module set to "maximum."

Each assembly shall accept coded signals from either 3M or Tomar.

### ***Optical Detector***

Each optical detector shall be a waterproof unit capable of receiving optical energy from two separately amiable directions. The horizontal angle between the two directions shall be variable from 180 degrees to 5 degrees.

The reception angle for each photocell assembly shall be a maximum of 8 degrees in all directions about the aiming axis of the assembly. Measurements of reception angle will be taken at a range of 1,000 feet for a Type I emitter and at a range of 1,800 feet for a Type II emitter.

Internal circuitry shall be solid state and electrical power shall be provided by the associated discriminator module.

Each optical detector shall be contained in a housing, with an electronic assembly and a base. The base shall be mounted with a Pelco Astro Mini-Brac No. AB0132-42, or approved equal, to the mast arm. A cable entrance shall be provided which shall have male threads and gasketing to permit a waterproof cable connection.

Each detector shall have mass of less than 2.4 lbs and shall present a maximum wind load area of 35 inch<sup>2</sup>. The housing shall be provided with weep holes to permit drainage of condensed moisture.

Each optical detector shall be installed, wired, and aimed as specified by the manufacturer.

### ***Discriminator Module***

Each discriminator module shall be designed to be compatible and usable with a Model 2070 controller unit and to be mounted in the input file of a Model 332 or Model 336 controller cabinet, and shall conform to the requirements of Chapter I of the California Department of Transportation Standard Specifications "Traffic Signal Control Equipment Specifications."

Each discriminator module shall be capable of operating two channels, each of which shall provide an independent output for each separate input.

Each discriminator module, when used with its associated detectors, shall perform the following:

- a. Receive Class I signals at a range of up to 1,000 feet and Class II signals at a range of up to 1,800 feet.
- b. Decode the signals, on the basis of frequency, at  $9.639 \text{ Hz} \pm 0.119 \text{ Hz}$  for Class I signals and  $14.035 \text{ Hz} \pm 0.255 \text{ Hz}$  for Class II signals.
- c. Establish the validity of received signals on the basis of frequency and length of time received. A signal shall be considered valid only when received for more than 0.50 second. No combination of Class I signals shall be recognized as a Class II signal regardless of the number of signals being received, up to a maximum of 10 signals. Once a valid signal has been recognized, the effect shall be held by the module in the event of temporary loss of the signal for a period adjustable from 4.5 seconds to 11 seconds in at least 2 steps at 5 seconds  $\pm 0.5$  second and 10 seconds  $\pm 0.5$  second.
- d. Provide an output for each channel that will result in a "low" or grounded condition of the appropriate input of a Model 2070 controller unit. For Class I signals the output shall be a  $6.25 \text{ Hz} \pm 0.1$  percent, rectangular waveform with a 50 percent duty cycle. For Class II signals the output shall be steady.

Each discriminator module shall receive electric power from the controller cabinet at either 24 V (dc) or 120 V (ac).

Two auxiliary inputs for each channel shall enter each module through the front panel connector. Pin assignment for the connector shall be as follows:

- a. Auxiliary detector 1 input, Channel A
- b. Auxiliary detector 2 input, Channel A
- c. Auxiliary detector 1 input, Channel B
- d. Auxiliary detector 2 input, Channel B

Each channel output shall be an optically isolated NPN open collector transistor capable of sinking 50 mA at 30 V (ac) and shall be compatible with the Model 2070 controller unit inputs.

Each discriminator module shall be provided with means of preventing transients received by the detector from affecting the Model 2070 controller assembly.

Each discriminator module shall have a single connector board and shall occupy one slot width of the input file. The front panel of each module shall have a handle to facilitate withdrawal and the following controls and indicators for each channel:

- a. Three separate range adjustments each for both Class I and Class II signals.
- b. A 3-position, center-off, momentary contact switch, one position (down) labeled for test operation of Class I signals, and one position (up) labeled for test operation of Class II signals.
- c. A "signal" indication and a "call" indication each for Class I and for Class II signals. The "signal" indication denotes that a signal above the threshold level has been received. A "call" indication denotes that a steady, validly coded signal has been received. These two indications may be accomplished with a single indication lamp; "signal" being denoted by a flashing indication and "call" with a steady indication.

In addition, the front panel shall be provided with a single circular, bayonet-captured, multipin connector for two auxiliary detector inputs for each channel. Connector shall be a mechanical configuration conforming to the requirements in Military Specification MIL-C-26482 with 10-4 insert arrangement, such as Burndy Trim Trio Bantamate Series, or approved equal consisting of the following:

- a. Wall mounting receptacle, G0B10-4PNE with SM20M-1S6 gold plated pins.
- b. Plug, G6L10-4SNE with SC20M-1S6 gold plated sockets, cable clamp and strain relief that shall provide for a right angle turn within 2½ -inch maximum from the front panel surface of the discriminator module.

### ***Cabinet Wiring - Detector***

The Model 332 cabinet has provisions for connections between the optical detectors, the discriminator module and the Model 2070 controller unit.

Wiring for Model 332 cabinet shall conform to the following:

- a. Slots 12 and 13 of input file "J" have each been wired to accept a 2-channel module.
- b. Field wiring for the primary detectors, except 24 V (dc) power, shall terminate on the terminal board TB-9 in the controller cabinet. Where TB-9 is used, position assignments shall be as follows:

<b><i>Position</i></b>	<b><i>Assignment</i></b>
4	Channel A detector input, 1 <sup>st</sup> module (Slot J-12)
5	Channel B detector input, 1 <sup>st</sup> module (Slot J-12)

7	Channel A detector input, 2 <sup>nd</sup> module (Slot J-13)
8	Channel B detector input, 2 <sup>nd</sup> module (Slot J-13)

The 24 V (dc) cabinet power will be available at Position 1 of terminal board TB-1 in the controller cabinet.

Field wiring for the auxiliary detectors shall terminate on terminal board TB-O in the controller cabinet. Position assignments are as follows:

<i>For Module 1 (J-12)</i>		<i>For Module 2 (J-13)</i>	
<i>Position</i>	<i>Assignment</i>	<i>Position</i>	<i>Assignment</i>
1	+24V (dc) from (J-12E)	7	+24V (dc) from (J-13E)
2	Detector ground from (J-12K)	8	Detector ground from (J-13K)
3	Channel A auxiliary detector input 1	9	Channel A auxiliary detector input 1
4	Channel A auxiliary detector input 2	10	Channel A auxiliary detector input 2
5	Channel B auxiliary detector input 1	11	Channel B auxiliary detector input 1
6	Channel B auxiliary detector input 2	12	Channel B auxiliary detector input 2

### **System Operation**

The Contractor shall demonstrate that the components of each system are compatible and will perform satisfactorily as a system. Satisfactory performance shall be determined using the following test procedure during the functional test period:

- a. Each system to be used for testing shall consist of an optical emitter assembly, an optical detector, an optical detector cable, and a discriminator module.
- b. The discriminator modules shall be installed in the proper input file slot of the Model 332 cabinet. The discriminator (signal processor) shall be installed in the J file of the 332 cabinet.
- c. Two tests shall be conducted; one using a Class I signal emitter and a distance of 1,000 feet between the emitter and the detector, the other using a Class II signal emitter and a distance of 1,800 feet between the emitter and the detector. Range adjustments on the module shall be set to "Maximum" for each test.
- d. Each 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 the emitter signal shall cause the proper response from the model 2070 controller unit during each "on" interval and there shall be no improper operation of either the Model 2070 controller unit or the monitor during each "off" interval.

### ***Removing, Reinstalling, or Salvaging Electrical Equipment***

Salvaged electrical materials shall be hauled to the City of Redding Corporation Yard located at 20055 Viking Way and stockpiled.

The Contractor shall provide the equipment, as necessary, to safely unload and stockpile the material. A minimum of two working days' notice shall be given prior to delivery.

### ***Equipment***

All equipment shall be provided by a vendor from the Caltrans Qualified Product List. The following equipment, or approved equal, shall be furnished by the Contractor:

1. Cabinet - Model 332A from Caltrans' approved vendor list with PDA#2 power distribution assembly, 206 Power Supply.
2. Controller from Caltrans approved vendor list, Model 2070 Naztec with Apogee Software.
3. Loop detectors - Reno A&E, Type C, 2-Channel, Rack Mount for 2070 System.
4. Two (2) Conflict monitors - EDI Model from Caltrans' approved vendor list.
5. Load switch - Model 200, GDI Model 200 only.
6. Flasher - Model 204.
7. Isolator - Model 242.
8. Signal Heads - Caltrans Qualified Product List.
9. Countdown Pedestrian Signal Heads - Dialight Corporation Mode 430-6450-001X
10. Other equipment as required to complete the signal in accordance with the plans and these special provisions.

### ***Payment***

The contract lump sum price or prices paid for "Signal and Lighting" shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in furnishing and installing the system, as shown on the plans, as specified in the Standard Specifications, these special provisions, and as directed by the Engineer, including any necessary pull boxes (except when the type required is shown as a separate pay item), temporary systems, excavation and backfill (except when shown as a separate pay item), concrete foundations, conduit of various sizes, video imaging vehicle detection system, restoring sidewalk or pavement and appurtenances damaged or destroyed during construction, salvaging existing materials, and making all required tests.

Full compensation for all additional materials and labor, including but not limited to "Sign (Internally Illuminated)" and "Sign (Mast Arm)", shown on the plans or specified, which are necessary to complete the installation of the various systems, shall be considered as included in the various systems, shall be considered as included in the prices paid for the systems, or units thereof, and no additional compensation will be allowed therefor.

Other roadway lighting on the project shall be considered as included in the contract lump sum price paid for lighting and sign illumination.

Full compensation for hauling and stockpiling electrical materials shall be considered as included in the contract price paid for the item requiring the material to be salvaged and no additional compensation will be allowed therefor.

**PART 8 MODIFICATIONS TO LANDSCAPING AND IRRIGATION**

**SECTION 800-1 LANDSCAPING MATERIALS**

**800-1.1 Topsoil**

**800-1.1.1 General**

Add one of the following sentences to the first paragraph, as appropriate:

Topsoil for erosion control planting shall be Class C (unclassified).

**OR**

Topsoil shall be Class "A".

**800-1.2.3 Commercial Fertilizer**

Add the following sentence to the first paragraph:

Fertilizer shall have a chemical analysis of 20-10-5 (N-P-K).

Commercial fertilizer for turf shall be Gro-Power Regular (5-3-1) or equal.

**800-1.2.4 Organic Soil Amendment**

Organic soil amendment shall be Type 1.

**800-1.2.5 Mulch**

Add the following sentence to the first paragraph:

Mulch for erosion control planting shall be Type 6 mulch (straw).

**800-1.3 Seed**

Add the following sentence to the first paragraph:

Grass seed shall be 40 percent Fawn Fescue, 40 percent Metalist 7 Rye grass and 20 percent Baron Bluegrass.

**800-1.4 Plants**

**800-1.4.1 General**

Delete the first paragraph and add the following paragraphs:

Plant material shall be subject to the approval of the Engineer prior to it being planted on the site. In the event any plant material is rejected, it shall be removed from the site immediately and replaced with suitable plants of the same species and variety.

Inspection of plant materials required by City, County, State, or Federal authorities shall be the responsibility of the Contractor, and he shall secure any required permits or certificates prior to the delivery of plants to the site.

#### **800-1.4.2 Trees**

Delete first, second, third, and fourth sentences of the first paragraph and add the following:

All trees shall be of the sizes, types, and varieties specified in the plant list and/or on the drawings.

#### **800-1.4.5 Sod and Stolons (Turf Grass)**

Delete the first and second paragraph and substitute the following:

Sod shall be fresh, clean, living sections of an **approved** sod blend 5/8-inch thick with a top growth of 2-inch minimum. The sod shall be free of turf disease, insects or weeds, and capable of healthy vigorous growth.

#### **800-1.5.3 Tree Stakes**

Add to the first paragraph:

Tree stakes shall be two inches (50mm) diameter, treated lodgepole pine, free of knots and splits or approved by the Engineer.

The second sentence of the second paragraph is amended to read:

"Plastic ribbon tie material shall be 1-inch (25mm) wide, minimum, plastic vinyl base tape with a minimum tensile strength of 500 pounds (2kN)."

### **SECTION 800-2 IRRIGATION SYSTEM MATERIALS**

#### **800-2.1.3 Plastic Pipe for Use with Solvent Weld Socket or Threaded Fittings**

Delete the first sentence of the second paragraph and substitute the following:

PVC Schedule 40 pipe shall be used for installation on the discharge side of control valves, and Schedule 40 pipe shall be used for continually pressurized pipe on the supply side of control valves and under all pavements.

Delete the third sentence of the third paragraph and add the following:

Plastic pipe fittings and coupling shall be PVC 1 or PVC 1/11 material supplied as follows:

Schedule 40 fittings and coupling for lateral pipe and for main pipe.

### **800-2.1.6 Polyethylene Pipe**

Flexible plastic pipe shall be polyethylene (PE) PE 2306, PE 3306, or PE 3406 Class 200 or greater as required to meet or exceed the pressure requirements of the system. Fittings shall be insert or compression type designed for use with PE pipe.

Polyethylene tubing for laterals shall be 2-inch nominal, .690-inch O.D. minimum, .704-inch O.D. maximum. All fittings shall be standard compression type matched to the tubing O.D. Any tubing that is, or has been kinked prior to, or during, installation, shall be removed and replaced with nonkinked tubing and the proper fittings. Polyethylene distribution tubing shall be sized as required to fit emitters.

### **800-2.2 Valves and Valve Boxes**

#### **800-2.2.1 General**

In the first sentence of the second paragraph, delete 200 psi and substitute 150 psi.

#### **800-2.2.4 Remote Control Valves**

Delete existing paragraph and substitute the following:

Remote-control valves shall be electrically operated. They shall be brass, glass-filled, and/or corrosion-resistant material with accurately machined valve surfaces and components, equipped with flow control adjustments, and capable of manual operation. They shall be made so that they may be readily disassembled for servicing. Schedule 80 PVC unions shall be installed on both sides of valve.

#### **800-2.2.6 Quick-Coupling Valves and Assemblies**

Delete the first sentence of the paragraph and add the following:

The quick-coupling valve shall be a two-piece type supplied in a one-inch size and capable of having a discharge rate of 30 gallons per minute with a pressure loss not to exceed 11.5 psi. The valve body shall be constructed of heavy-cast brass, the cover shall be a spring-loaded, self-closing type of cadmium-plated cast iron. The valve throat shall have a keyway with detent positions for regulating water flow.

#### **800-2.2.7 Valve Boxes**

The first sentence shall read:

Valve boxes and covers shall be minimum 12" precast portland cement concrete or covered green plastic box.

### **800-2.3 Backflow Preventer Assemblies**

The first paragraph shall read:

The backflow preventer assembly...conforming to the governing code requirements of Section 7601 of the California Code of Regulations and approved for use by the California Department of Health Services.

### **800-2.4 Sprinkler Equipment**

The second sentence of the first paragraph, shall read:

Such equipment shall be brass, bronze, stainless steel, and/or heavy duty, high-strength plastic, except for minor components.

## **SECTION 801 INSTALLATION**

### **801-2 Earthwork and Topsoil Placement**

#### **801-2.2.1 General**

The first sentence is amended to read:

The type and thickness of topsoil shall be shown on the plans, or if not shown shall be Class C for erosion control planting.

The fourth paragraph is amended to read:

Class C topsoil shall be scarified and cultivated to a depth of three inches below finish grade. During this operation, all stones over four inches in greatest dimension shall be removed.

#### **801-2.2.2 Fertilizing and Conditioning Procedures**

The first sentence of the second paragraph is amended to read:

Fertilizer shall be applied at a rate of 500 pounds per acre.

#### **801-2.3 Finish Grading**

Add the following paragraph:

The finish grade shall be subject to the approval by the Engineer prior to any planting. The Contractor shall be responsible to adjust all existing valve boxes, electrical boxes, etc., within the work area to finish grade.

## **801-4 Planting**

### **801-4.1 General**

First paragraph shall read:

The types...specifications and/or the construction drawings.

Add to the following paragraph between the second and third paragraph:

After the installation of plants, the Contractor shall treat all shrubs with a preemergent herbicide.

### **801-4.5 Tree and Shrub Planting**

First sentence of first paragraph shall read:

. . . holes shall be generally circular . . .

### **801-4.8.2 Seed**

The first sentence of the first paragraph is amended to read:

Seed lawn planting shall be accomplished by Method B (Hydraulic Method).

The fourth paragraph is amended to read:

After sowing the area shall be evenly covered with Straw Stabilization at the rate of 6,000 pounds per acre.

Add the following to the ninth paragraph:

The seed mixture for lawn planting shall be applied at the rate of ten (10) pounds per 1,000 square feet. Fiber shall be applied at the rate of thirty (30) pounds per 1,000 square feet for wood cellulose fiber or fifty (50) pounds per 1,000 square feet for cellulose paper fiber, or per the manufacturer's recommended application rate.

### **801-4.9 Erosion Control Planting**

Delete this section in its entirety and refer to "Erosion Control" in the Miscellaneous Requirements of these special provisions.

## **801-5 Irrigation System Installation**

### **801-5.1 General**

The first paragraph shall read:

". . . in accordance with the Specifications and construction drawings."

### **801-5.2 Trench Excavation and Backfill**

Add the following paragraph:

Any settling of more than one inch, which may occur during the guarantee period, shall be brought to finish grade by the Contractor at his expense.

### **801-5.3 Irrigation Pipeline Installation**

#### **801-5.3.1 General**

In the first and second sentences of the second paragraph, the word "sand" shall be substituted for the phrase "finely divided material."

#### **801-5.3.3 Plastic Pipeline**

Substitute "PVC" wherever the word "plastic" is used in this section.

### **801-5.4 Installation of Valves, Valve Boxes, and Special Equipment**

The second sentence of the fourth paragraph is amended to read:

All valves shall be housed in a covered precast concrete box in hard surfaced areas and green plastic box in turf and planted area of a size that will permit easy access for servicing.

Add the following to the sixth paragraph:

All valve access boxes shall be installed on a twelve inch layer of crushed rock to provide proper foundation and drainage. The maximum clearance between the valve, in a fully open position, and the bottom of the valve box lid shall be three inches. The minimum clearance between the bottom of the piping and the bottom of the valve box or valve box pipe knockouts shall be two inches. The minimum clearance between the valve and sides of the valve box shall be three inches.

### **801-5.5 Sprinkler Head Installation and Adjustment**

#### **801-5.5.1 General**

Add the following paragraph:

One cubic foot of pea gravel shall be installed around the base of each impact rotor pop-up or gear-driven rotor pop-up sprinkler.

#### **801-5.5.2 Location, Elevation, and Spacing**

The fourth paragraph is amended to read:

Shrub heads, and bubbler heads shall be installed at top of bark level.

### **801-5.5.3 Riser and Nozzle Line Installation**

The second paragraph is amended to read:

Risers for above ground oscillating sprinklers and nozzle lines shall be galvanized steel pipe. All other riser shall be Schedule 80 PVC unless otherwise shown on the plans or called for in these specifications. All pipe between the connection to the lateral or main and the sprinkler head shall be threaded.

Add the following to the sixth paragraph:

Prior to the installation of sprinkler head and riser assemblies, the Contractor shall submit samples of each type to the Engineer for approval.

### **801-5.6 Automatic Control System Installation**

The first sentence of the fourth paragraph is amended to read:

All service wiring shall be installed at the minimum depth specified in subsection 801-5.2 in galvanized steel or Schedule 80 PVC conduit from the service point to the controller.

The fifth sentence of the fourth paragraph is amended to read:

Pull boxes shall be twelve inch concrete or green plastic, set to grade on a twelve inch layer of one inch crushed rock.

## **SECTION 801-6 MAINTENANCE AND PLANT ESTABLISHMENT**

Add the following between the first and second paragraph:

Maintenance shall include, but not be limited to watering, weeding, mowing, cultivating, pruning, staking and tying, control of rodents and insect pests, fungus control, trash pick-up and removal, and repairing any damage caused by pedestrian or vehicle encroachment into the planting and/or turf areas. The Contractor shall provide barricades, temporary fencing, signs, or policing as may be necessary to control damage to seeded and/or planted areas.

Irrigation water shall be applied at a rate which does not exceed the infiltration rate of the soil. The controller shall be programmed to prevent ponding and minimize runoff.

Add the following between the second and third paragraph:

All plants that die or are in a serious declining state during the establishment period shall be replaced with materials identical to the original plants at no additional cost to the City. All plant replacements shall be made within ten (10) days after receiving notice from the Engineer to replace dead or declining plant materials.

Upon completion of the maintenance and plant establishment period, all grass areas shall have a uniform germination and growth habit. The Contractor shall be responsible to reseed or replace portions of lawn that fail to germinate due to weather conditions, damage due to pedestrian or vehicle traffic, diseases, insects, weeds, or other pests. If deficiencies

are noted by the Engineer at the final acceptance inspection, the plant establishment period shall be extended until such deficiencies are corrected to the satisfaction of the Engineer.

At completion of the maintenance and plant-establishment period, **all** areas included in the contract shall be clean and free from debris and weeds.

The first sentence of the fourth paragraph shall read:

The Contractor shall request a final inspection by **written notice** to begin the plant-establishment period . . .

Add to the fourth paragraph:

Subsequent to the final inspection and if the landscaping is acceptable, the City shall give written notice to the Contractor stating the beginning and ending dates for the 90-day plant establishment period.

The second sentence of the fifth paragraph shall read:

"The plant establishment period shall be for a period of 90 calendar days and shall be extended by the Engineer if the planted areas are improperly maintained, appreciable plant replacement is required, or other corrective work becomes necessary."

Add the following paragraph after the fifth paragraph:

Apply commercial fertilizer, (5-3-1), at 25 pounds per 1,000 SF (11k per 100m<sup>2</sup>) and water thoroughly between the 45th and 50th days of the plant establishment period of the turf areas. Other application rates may be used if approved by the Engineer.

### ***Pest Control Program***

A pest control program shall be administered to all areas within the project limits by personnel licensed by the California Department of Food and Agriculture. A **minimum** of 72 hours prior to spraying, the Contractor shall submit to the Engineer for approval the name and application rate of the chemical pesticide proposed to be used.

Pest control shall include, but not be limited to the application of chemical pesticide to control and exclude 100 percent of all pests in the planting and/or nonplanted areas. For the purposes of this contract, a pest is defined as weeds, diseases, insects or anything destructive to plant materials called for in these specifications.

Any new or existing plant materials, which in the opinion of the Engineer, have been damaged by the application of chemical pesticides shall be replaced by the Contractor at his expense. Full compensation for the pest control program shall be considered as included in the contract lump sum price paid for Plant Establishment, and no additional compensation will be allowed therefor.