

DRAFT

**SERVICE AGREEMENT BETWEEN THE CITY OF SUNNYVALE
AND AEGIS ITS INC.
FOR TRAFFIC SIGNAL PREVENTATIVE MAINTENANCE AND REPAIR SERVICES**

THIS AGREEMENT, dated _____, is by and between the CITY OF SUNNYVALE, a municipal corporation ("CITY"), and AEGIS ITS, INC., a California Incorporated Company ("CONTRACTOR").

WHEREAS, on March 30, 2015, CITY issued Request for Proposals No. F15-83 for Traffic Signal Preventive Maintenance and Repair Services; and

WHEREAS, CONTRACTOR has submitted a proposal in response to RFP No. F15-83; and

WEHREAS, CITY has determined that CONTRACTOR possess the skills necessary to perform the services required hereunder; and,

NOW, THEREFORE, THE PARTIES ENTER INTO THIS AGREEMENT.

1. Services by CONTRACTOR

CONTRACTOR shall provide services in accordance with Exhibit "A" attached and incorporated by reference, which consists of RFP No. F15-83 and its specifications, terms and conditions, and proposer's completed response.

2. Time for Performance

The term of this Agreement shall be from July 1, 2015 to June 30, 2016 unless otherwise terminated. CONTRACTOR shall deliver the agreed upon services to CITY as specified in Exhibit "A". Agreement may be extended by written amendment up to four additional years based upon acceptable pricing and service. Extensions of time may be granted by the City Manager upon a showing of good cause.

3. Duties of CITY

CITY shall supply any documents or information available to City required by CONTRACTOR for performance of its duties. Any materials provided shall be returned to CITY upon completion of the work.

4. Compensation

CITY agrees to pay CONTRACTOR at the amounts and rates detailed in Exhibit "B". Total compensation shall not exceed Five Hundred Eighty-Four Thousand Seven Hundred Seventy-Two and no/100 (\$584,772.00). CONTRACTOR shall submit invoices to CITY no more frequently than monthly for services provided to date. Payment shall be made within thirty (30) days upon receipt of an accurate, itemized invoice by CITY's Accounts Payable Unit.

5. Ownership of Documents

CITY shall have full and complete access to CONTRACTOR's working papers, drawings and other documents during progress of the work. All documents of any description prepared by CONTRACTOR shall become the property of the CITY at the completion of the project and upon payment in full to the CONTRACTOR. CONTRACTOR may retain a copy of all materials produced pursuant to this Agreement.

6. Conflict of Interest

CONTRACTOR shall avoid all conflicts of interest, or appearance of conflict, in performing the services and agrees to immediately notify CITY of any facts that may give rise to a conflict of interest. CONTRACTOR is aware of the prohibition that no officer of CITY shall have any interest, direct or indirect, in this Agreement or in the proceeds thereof. During the term of this Agreement CONTRACTOR shall not accept employment or an obligation which is inconsistent or incompatible with CONTRACTOR'S obligations under this Agreement.

7. Confidential Information

CONTRACTOR shall maintain in confidence and at no time use, except to the extent required to perform its obligations hereunder, any and all proprietary or confidential information of CITY of which CONTRACTOR may become aware in the performance of its services.

8. Compliance with Laws

- (a) CONTRACTOR shall not discriminate against, or engage in the harassment of, any City employee or volunteer or any employee of CONTRACTOR or applicant for employment because of an individual's race, religion, color, sex, gender identity, sexual orientation (including heterosexuality, homosexuality and bisexuality), ethnic or national origin, ancestry, citizenship status, uniformed service member status, marital status, family relationship, pregnancy, age, cancer or HIV/AIDS-related medical condition, genetic characteristics, and physical or mental disability (whether perceived or actual). This prohibition shall apply to all of CONTRACTOR's employment practices and to all of CONTRACTOR's activities as a provider of services to the City.
- (b) CONTRACTOR shall comply with all federal, state and city laws, statutes, ordinances, rules and regulations and the orders and decrees of any courts or administrative bodies or tribunals in any manner affecting the performance of the Agreement.

9. Independent Contractor

CONTRACTOR is acting as an independent contractor in furnishing the services or materials and performing the work required by this Agreement and is not an agent, servant or employee of CITY. Nothing in this Agreement shall be interpreted or construed as creating or establishing the relationship of employer and employee between CITY and CONTRACTOR. CONTRACTOR is responsible for paying all required state and federal taxes.

10. Indemnity

CONTRACTOR shall indemnify and hold harmless CITY and its officers, officials, employees and volunteers against any and all suits, claims, damages, liabilities, costs and expenses, including attorney fees, arising out of the performance of the work described herein, to the extent caused by or related to the negligent acts, omissions, or willful misconduct of CONTRACTOR, its employees, subcontractors, or agents in the performance (or non-performance) of services under this Agreement, except where caused by the sole negligence or willful misconduct of the CITY.

11. Insurance

CONTRACTOR shall take out and maintain during the life of this Agreement policies of insurance as specified in Exhibit "C" attached and incorporated by reference, and shall provide all certificates or endorsements as specified in Exhibit "C."

12. Wage Rates

Pursuant to the Labor Code of the State of California, or any applicable local law, CITY has ascertained the general prevailing rate per diem wages and rates for holidays, and overtime work in the city, for each craft, classification or type of laborer, worker, or mechanic needed to execute this Contract. CITY has adopted, by reference, the general prevailing rate of wages applicable to the work to be done under the Contract, as adopted and published by the Division of Labor Standards Enforcement and Labor Statistics and Research of the State of California, Department of Industrial Relations, to which reference is hereby made for a full and detailed description. A copy of the prevailing wage rates may be reviewed in the office of the Director of Public Works, City of Sunnyvale, 456 West Olive Avenue, Sunnyvale, California. Wage rates can also be obtained through the City's Website at:

http://sunnyvale.ca.gov/DoingBusiness.aspx#Prevailing_Wage. Neither the notice inviting bids nor this Contract shall constitute a representation of fact as to the prevailing wage rates upon which the Contractor or any subcontractor may base any claim against CITY.

It shall be mandatory upon Contractor and upon any subcontractor to pay not less than the specified rates to all laborers, workers, and mechanics employed in the execution of the Contract. It is further expressly stipulated that Contractor shall, as a penalty to CITY, forfeit fifty dollars (\$50.00) for each calendar day, or portion thereof, for each laborer, worker, or mechanic paid less than the stipulated prevailing rates for any work done under this Contract by Contractor or by any subcontractor; and Contractor agrees to comply with all provisions of Section 1775 of the Labor Code.

In case it becomes necessary for Contractor or any subcontractor to employ on the project under this Contract any person in a trade or occupation (except executives, supervisory, administrative, clerical, or other non-manual workers as such) for which no minimum wage rate is herein specified, Contractor shall immediately notify Owner who will promptly thereafter determine the prevailing rate for such additional trade or occupation and shall furnish Contractor with the minimum rate based thereon. The minimum rate thus furnished shall be applicable as a minimum for such trade or occupation from the time of the initial employment of the person affected and during the continuance of such employment.

12. CITY Representative

Shahid Abbas, Transportation/Traffic Manager, as the City Manager's authorized representative, shall represent CITY in all matters pertaining to the services to be rendered under this Agreement. All requirements of CITY pertaining to the services and materials to be rendered under this Agreement shall be coordinated through the CITY representative.

13. CONTRACTOR Representative

Rodney Mathis, Executive Vice President, shall represent CONTRACTOR in all matters pertaining to the services and materials to be rendered under this Agreement; all requirements of CONTRACTOR pertaining to the services or materials to be rendered under this Agreement shall be coordinated through the CONTRACTOR representative.

14. Notices

All notices required by this Agreement, other than invoices for payment which shall be sent directly to Accounts Payable, shall be in writing, and shall be personally delivered, sent by first class with postage prepaid, or sent by commercial courier, addressed as follows:

To CITY: Shahid Abbas, Transportation/Traffic Manager
Public Works/ Transportation and Traffic
CITY OF SUNNYVALE
P. O. Box 3707
Sunnyvale, CA 94088-3707

To CONTRACTOR: Rodney Mathis, Executive Vice President
Aegis ITS, Inc.
3360 East La Palma Avenue
Anaheim, CA 92806-2856

Nothing in this provision shall be construed to prohibit communication by more expedient means, such as by telephone or facsimile transmission, to accomplish timely communication. However, to constitute effective notice, written confirmation of a telephone conversation or an original of a facsimile transmission must be sent by first class mail or commercial carrier, or hand delivered. Each party may change the address by written notice in accordance with this paragraph. Notices delivered personally shall be deemed communicated as of actual receipt; mailed notices shall be deemed communicated as of two days after mailing, unless such date is a date on which there is no mail service. In that event communication is deemed to occur on the next mail service day.

15. Assignment

Neither party shall assign or sublet any portion of this Agreement without the prior written consent of the other party.

16. Termination

If CONTRACTOR defaults in the performance of this Agreement, or materially breaches any of its provisions, CITY at its option may terminate this Agreement by giving

written notice to CONTRACTOR. If CITY fails to pay CONTRACTOR, CONTRACTOR at its option may terminate this Agreement if the failure is not remedied by CITY within thirty (30) days after written notification of failure to pay.

Without limitation to such rights or remedies as CITY shall otherwise have by law, CITY also shall have the right to terminate this Agreement for any reason upon ten (10) days' written notice to CONTRACTOR. In the event of such termination, CONTRACTOR shall be compensated in proportion to the percentage of services performed or materials furnished (in relation to the total which would have been performed or furnished) through the date of receipt of notification from CITY to terminate. CONTRACTOR shall present CITY with any work product completed at that point in time.

17. Entire Agreement; Amendment

This writing constitutes the entire agreement between the parties relating to the services to be performed or materials to be furnished hereunder. No modification of this Agreement shall be effective unless and until such modification is evidenced by writing signed by all parties.

18. Miscellaneous

Time shall be of the essence in this Agreement. Failure on the part of either party to enforce any provision of this Agreement shall not be construed as a waiver of the right to compel enforcement of such provision or any other provision. This Agreement shall be governed and construed in accordance with the laws of the State of California.

IN WITNESS WHEREOF, the parties have executed this Agreement.

ATTEST:

CITY OF SUNNYVALE ("CITY")

By _____
City Clerk

By _____
City Manager

APPROVED AS TO FORM:

Aegis ITS, Inc.
("CONTRACTOR")

By _____
City Attorney

By _____

Name and Title

Name and Title

Exhibit A



CITY OF SUNNYVALE, CALIFORNIA

REQUEST FOR PROPOSALS #F15-83

FOR

**TRAFFIC SIGNAL PREVENTIVE MAINTENANCE
AND REPAIR SERVICES**

**Date of Publication
March 30, 2015**

**PROPOSALS DUE:
April 22, 2015 by 3:00 PM PST**

**In the Purchasing Division
Sunnyvale City Hall Annex
650 West Olive Avenue
PO Box 3707
Sunnyvale, CA 94088-3707**

**BUYER: Des Gebre
(408) 730-7612
dgebres@sunnyvale.ca.gov**

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SECTION I. NOTICE INVITING PROPOSALS

The City of Sunnyvale is seeking proposals from qualified contractors to provide a comprehensive Traffic Signal Preventive Maintenance and Repair Program for a one (1) year period with an option to extend the contract for additional periods of time based on acceptable pricing and service. The total contract period is anticipated to be five (5) years.

SECTION II. INSTRUCTIONS TO PROPOSERS

- A. **Preparation of Proposals** – Proposals shall be made on the Proposal Form included in this Request for Proposals. Proposers shall enter all requested information in the appropriate spaces on the Proposal Form. No oral, telephone, facsimile or electronic proposals will be accepted. All costs of proposal preparation shall be borne by the proposer.
- B. **Examination of Proposal Documents** - The Proposal Documents consist of this Request for Proposals, each and every document listed in the Table of Contents of the request, and any addenda which may have been issued. Proposers shall thoroughly examine and be familiar with all Proposal Documents. Submission of a proposal shall constitute proposer's acknowledgment upon which the City may rely that the proposer has thoroughly examined and is familiar with the Proposal Documents. Failure or neglect of a proposer to receive or examine all or part of the Proposal Documents shall in no way relieve the proposer from any obligations with respect to this Request for Proposals or any resultant Contract. No claim for additional compensation will be allowed which is based upon a lack of knowledge of any part of the Proposal Documents.
- C. **Conformance to Proposal Requirements** - Proposals shall conform to the requirements of this Request for Proposals. All requested attachments shall be submitted with the completed Proposal Form and in the designated format. Failure to comply with all requirements may result in proposal rejection.
- D. **Interpretation of Proposal Documents and Addenda** - Should a proposer discover conflicts or ambiguity in the Proposal Documents that require a decision or explanation, the proposer may request an interpretation. Such a request shall be made in writing and delivered to the person identified on the cover page of this Request for Proposals no later than five (5) calendar days before the deadline for receipt of proposals. Every interpretation made to proposers will be in the form of an Addendum issued by the City. Addenda, if issued, will be sent as promptly as possible to all parties that have been issued Proposal Documents. Only properly issued Addenda shall be binding upon City; any oral and/or other form of interpretation or clarification will have no legal or contractual effect. Proposers shall acknowledge the receipt of Addenda on the Proposal Form.
- E. **Proposer Inquiries** – All questions or comments concerning the requirements of this RFP shall be made in writing. Any questions regarding the proposal process and/or City requirements shall be directed to:

Des Gebre	(408) 730-7710 (FAX)
City of Sunnyvale	(408) 730-7612 (VOICE)
650 West Olive Avenue	dgebre@sunnyvale.ca.gov
Sunnyvale, CA 94086	

- F. **Submission of Proposals** – Proposers shall submit original (clearly marked 'Original') and five (5) copies (clearly marked 'Copy') of the completed Proposal Form, together with any required attachments or explanatory materials, by the time and date set for receiving proposals as stated on the cover page of this Request for Proposals or any modifying Addenda. Proposals shall be delivered in a sealed envelope **clearly marked Request for Proposals F15-83** addressed to:

City of Sunnyvale
Purchasing Division
City Hall Annex
650 West Olive Avenue
PO Box 3707
Sunnyvale, CA 94088-3707

Proposer shall also submit one electronic copy (CD or USB) of the proposal.

- G. Confidentiality of Documents** – All proposals shall be deemed public documents at the time of contract award to the Successful Proposer. The RFP is intended to be worded in a manner so as not to elicit proprietary information. If proprietary information is submitted as part of the proposal, such information shall be clearly labeled "Proprietary" and accompanied by a request that the information be returned by the City to the Proposer.

The information on the pages of the proposal identified as proprietary will be used only for the evaluation of the proposal, but proposer understands that disclosure may be required under the California Public Records Act or other federal, state, and local law, as determined by the City.

Note that wholesale use of headers/footers bearing designations such as "confidential", "proprietary", or "trade secret" on all or nearly all of a proposal is not acceptable, and may be deemed by the City as a waiver of any exemption claim. Any Proposal that includes a blanket statement or limitation, which would prohibit or limit public inspection may be considered non-responsive and may be rejected. Pricing information is generally not considered proprietary information.

The identification of exempt information must be more specific. The City assumes no responsibility for disclosure or use of unmarked data for any purposes.

H. Modification or Withdrawal of Proposals

1. Before Date and Time for Receipt of Proposals - Proposals that contain mistakes discovered by a proposer before the date and time for receipt of proposals may be modified or withdrawn by written notice to City's Purchasing Officer received prior to the deadline. Any modification shall be clearly identified as such and shall be made in writing, executed and submitted in the same form and manner as the original proposal.
2. After Date and Time for Receipt of Proposals - A proposer may not modify its proposal after the date and time set for receipt of proposals. A proposer alleging a mistake in a proposal may be permitted to withdraw its proposal if the proposer alleges that a mistake was made in its proposal that made the price materially different than intended, provided that bidder gives written notice of the mistake and the manner in which it occurred to City's Purchasing Officer within five (5) calendar days following the deadline for receipt of proposals and City's Purchasing Officer deems it to be in the best interest of the City.

- I. Late Proposals** - Proposers shall be responsible for the timely delivery of proposals. Proposals received after the deadline for receipt of proposals shall not be accepted and shall be returned to the proposer unopened unless necessary for identification purposes.

- J. Proposals to Remain Open** - The proposer shall guarantee its proposal for a period of sixty (60) calendar days from the date of proposal opening.

- K. Non-Collusion Certification** - By submitting a proposal, proposer is certifying that it has not directly or indirectly been collusive with any other proposers in the preparation and submission of the proposal. If at any time it shall be found that the proposal to whom a contract has been awarded has, in presenting the bid, colluded with any other party or parties, said proposer shall be liable to the City for all loss or damage which the City has or may suffer as the result of the collusive activity, including, but not limited to, the cost of advertising and awarding a new contract.

L. Evaluation Criteria - Proposals will be evaluated based on the following criteria:

<u>Item</u>	<u>Criteria</u>	<u>Possible Points</u>
1.	Qualifications, Experience and Maintenance/Management Systems	60
2.	References	15
3.	Cost/Overall Value	25
	Total	100

M. Sunnyvale Business License – The successful proposer must either possess a current, valid Sunnyvale business license or must have submitted a Sunnyvale business license application and fee at the time of award.

N Invoicing Requirements – The successful proposer shall submit monthly invoices accompanied with a detailed description of the work accomplished.

O. Contract Award - Contract award will be made to the proposer whose proposal offers the best value to the City of Sunnyvale. The acceptance of a proposal will be evidenced by a written contract delivered to the successful proposer for execution.

P. Contract Documents - Contract documents will consist of this Request for Proposals; its attachment(s) and addenda, if any; the successful proposer's completed and signed Proposal Form; the successful proposer's proof of insurance coverage; and an executed Service Agreement (Attachment K).

Q. Contract Acceptance – Proposer must indicate their willingness to execute the attached sample Service Agreement and must submit any proposed changes to the Agreement along with an explanation of the request as part of their response to this RFP. The City reserves the sole right to accept, reject or modify any proposed changes to the Agreement. The City shall not consider any proposed revisions to the Agreement received after the due date for receipt of proposals.

R. Reservations - The City reserves the right to:

1. Postpone the date and time announced for receipt of proposals by issuance of an Addendum at any time prior to the deadline for receipt of proposals;
2. Reject any proposal that is conditional in any way or that contains erasures, items not called for, items not in conformity with applicable law, changes, additions, alternate proposals, or any other modifications of the Proposal Form which are not in accordance with the Proposal Documents;
3. Make any investigations deemed necessary to determine proposer's ability to satisfactorily meet City requirements;
4. In the event that only one proposal is received in response to this Request for Proposals, require the sole proposer to submit cost or pricing data to assist in determining if the price is reasonable;
5. Reject any or all proposals;
6. Waive minor defects or irregularities in any proposal, provided that the discrepancy does not affect the proposal amount or give the proposer an advantage over others;

SECTION III. SPECIFICATIONS, PROPOSER QUALIFICATIONS

- A. **Background** - The City of Sunnyvale's Traffic Signal Preventive Maintenance and Repair Program involves ongoing and regular field preventive maintenance and repair of traffic signals and other related equipment by a licensed contractor with properly trained, experienced and qualified personnel. The City of Sunnyvale currently operates and maintains 130 traffic signals, 10 in-road warning light (IRWL) and 4 flashing beacon systems, which are listed in Attachment B.

The City requires quarterly preventive maintenance on all traffic signals, IRWL, and flashing beacons systems listed in Attachment B. In addition, the City requires an annual preventive maintenance check and an annual inventory of all components of each traffic signal.

The contract which may result from this Request for Proposals will include, but not be limited to, the following provisions:

- Regular quarterly preventive maintenance services and cleaning and inspection of all signalized intersections on an ongoing basis.
- Regular quarterly daylight inspection of all traffic signals, IRWL, and flashing beacon systems.
- Annual preventive maintenance of all traffic signals, IRWL, and flashing beacons systems.
- Repair or replacement of traffic signal control devices, as requested.
- Warranty service and management of warranty claims for any and all traffic signal equipment used by the City.
- Advance notification to City staff for any and all planned work.
- Regular submission to the City of accurately maintained and detailed inventory records of traffic signal equipment.
- Regular submission to the City of accurate monthly activity records and reports of any and all work and service calls related to the City's traffic signals.
- Response to all service requests in a timely manner.
- An assessment of liquidated damages for failure to provide a timely response to service requests.
- Professional and diligent performance of all contract requirements.

- B. **Detailed Project Specifications** – See Attachment “A” for detailed City of Sunnyvale project specifications.

- C. **Proposer Qualifications** – Proposers shall possess a valid California State Contractor's License, either Class “A” or Class “C-10” throughout with contract term, including extensions, if any, and shall be experienced performing similar services of similar scope for other public agencies.

SECTION IV. TERMS AND CONDITIONS

- A. **Service Agreement** - The terms and conditions which apply to this purchase shall be those set forth in the attached sample Service Agreement (Attachment K), including the City's insurance requirements for the successful proposer. Any exceptions to the City's Service Agreement must be submitted in writing as part of the proposer's response.
- B. **Prevailing Wages** - Proposer shall abide by the requirements set forth under Section 1773 of the Labor Code of the State of California for prevailing wages.
- C. **Contractor Registration** - In order to be considered for contract award, Contractor and any Subcontractors must be registered with the California Department of Industrial Relations through the Public Works Contractor Registration Program.

SECTION V. INSTRUCTIONS FOR COMPLETION OF PROPOSAL FORM

- A. **Entries on Proposal Form** - All entries shall be printed in ink or shall be typewritten.
- B. **Corrections** - Corrections shall be initialed in ink by the person signing the proposal.
- C. **Project Pricing** - Proposal pricing shall be complete, including all costs for labor, supervision, methods or processes, implements, tools, machinery, equipment, transportation and materials required to complete the work described in this Request for Proposals. Proposers will be evaluated on the overall cost and value of their proposal over the anticipated total contract period of five (5) years.
- D. **Required Information** - All information requested for entry on the Proposal Form must be provided. If necessary, proposers may attach additional sheets clearly cross referenced to the applicable item number. In addition, proposer shall attach and submit the detailed narratives described in Item 11 of the Proposal Form.
- E. **Addenda** – Proposers shall indicate the number and date of all addenda received.
- F. **Signature** - Proposals shall be signed by an authorized representative of proposer.

DETAILED SPECIFICATIONS

ATTACHMENT A

III. SCOPE OF WORK

A. SERVICES

The Contractor shall provide ongoing and regular field preventive maintenance and repair of traffic signal equipment, In-Roadway Warning Light (IRWL) systems, flashing beacons systems, and other related equipment by duly trained and qualified personnel.

The Contractor is required to have on staff and available to perform Services under this contract, designated solely for the City of Sunnyvale a minimum of 1 utility personnel and 2 Traffic Signal Technicians. If the Contractor fails to conduct and finish 11 Annual Preventive Maintenance checks within the first 11 days of the month for any 2 months within a 6 month window or finish all Quarterly Preventive Maintenance checks within any quarter the City will require that the Contractor have on staff designated solely for the City of Sunnyvale, a minimum of 1 Traffic Signal Technician per 45 signalized intersections. The Traffic Signal Technician shall have a minimum of four years of experience in traffic signal repairs. The Traffic Signal Technician shall have experience with the operation and maintenance of type 170, 2070, and various NEMA controllers currently in use by the City of Sunnyvale. The Traffic Signal Technician shall also be familiar with all software in use by the City of Sunnyvale, including but not limited to McCain-BiTrans 233, McCain-BiTrans 200SA, McCain-BiTrans 210FM, Caltrans C7 and C8, SCATS Adaptive, RHODES Adaptive, Naztec Apogee and Fourth Dimension Traffic D4 Signal. The Traffic Signal Technician shall also have knowledge of the operation and maintenance of inductive traffic loops, video detection systems, EMTRAC emergency vehicle preemption devices, Microwave interconnect, twisted pair interconnect, wireless 2.4GHz Spread Spectrum Radio communications, and fiber optic cables. The Traffic Signal Technician shall keep up to date on the operation and maintenance of all state-of-the-art traffic signal control device and related equipment to ensure that the City's needs will also be supported in the future. The Traffic Signal Technician shall also be familiar with and adhere to all Caltrans and City programming standards for both traffic signal and coordination timing of traffic signal controllers. Traffic Signal technician and utility personnel must be available to work in Sunnyvale 8 hrs a day, 5 days a week. In addition to these requirements, the Contractor must have on staff an IMSA certified Fiber Optics for ITS Level 1 technician that will be available for fiber troubleshooting, repairs, and splicing on a 24-hour a day, 7 days per week basis, including all holidays.

The Contractor is required to have on staff and available to perform services under this contract a Traffic Signal Analyst with a minimum of ten years' of experience in traffic signal timing and coordination operations. The Traffic Signal Analyst, as directed by the City, shall focus on maximizing the overall efficiency of traffic signal timing and coordination operations in the City of Sunnyvale. The Traffic Signal Analyst shall be familiar with the McCain-BiTrans 233 software for type 170 controllers, McCain-BiTrans QuicTrac and QuicNet software, and Fourth Dimension Traffic D4 Signal controller software for VTA Light Rail, SCATS adaptive traffic signal control software, RHODES adaptive traffic signal control software, time of day coordination, traffic responsive coordination, and the various communications mediums used for traffic signal interconnection. The Traffic Signal Analyst shall also be knowledgeable about the operation of all traffic signal equipment currently in use by the City of Sunnyvale. The Traffic Signal Analyst shall maintain a good working knowledge on the operation of any state-of-the-art traffic signal control device or related equipment to ensure that the City's needs will also be supported in the future. The Traffic Signal Analyst shall also be familiar with and adhere to all Caltrans and City programming standards for both traffic signals and coordination timing of traffic signal controllers.

The Contractor shall provide and maintain emergency service response of the City's traffic signals on a 24-hour a day, 7 days per week basis, including all holidays.

The Contractor must provide a vehicle for the use of the Contractor's Traffic Signal Technician which shall be equipped with a permanently mounted arrow board; warning beacon/strobe lights; traffic cones; construction warning signs; a hydraulic bucket capable of reaching a height of 40 feet from the roadway surface; proper lighting for illuminating the work area at night; necessary computer laptop for programming, maintenance and testing of traffic signal controllers and various equipment; and communications equipment for dispatch. In addition, Contractor's

employee shall be required to have radio communication equipment for dispatch purposes. At a minimum, this shall be a cellular phone capable of numeric and text messages with vibration alert. All of the required equipment shall be properly maintained and functional 24 hours a day, 7 days a week, including holidays.

The Contractor shall ensure that any vehicle used within the boundaries of the City of Sunnyvale where lane closures or work within the travel lanes is required shall be equipped with an arrow board, warning beacons/strobe lights, the proper quantity and sized cones for a lane closure, and advance warning signs. All of the Contractor's employees working within the boundaries of the City shall be equipped with a communications device capable of instant 2-way communications for extended periods of time with the Contractor's shop or with City staff.

The Contractor must possess, and have readily accessible in functioning order, all required tools, equipment, apparatus, facilities, and materials need to perform all work necessary to maintain and repair the traffic signals and flashing beacons listed in Attachment B in compliance with current Caltrans and City standards and specifications. This includes but is not limited to LED Degradation Tester for 12" and 8" indications, Conflict Monitor Tester for 210, 2010, 2018 and NEMA type Conflict Monitor Units, Battery Tester for 12VDC and 24VDC batteries used in uninterruptible power supply systems, SPIRENT Tech X Field Tester for SIC cable, and grounding system tester. This equipment shall be available at all times for use solely in the City of Sunnyvale.

The Contractor shall furnish temporary replacement traffic signal controllers, coordination units, preemption units, traffic signal communications and monitoring equipment, detector amplifiers, conflict monitors, video detection systems, and uninterruptible power supplies for traffic signals and various other standard traffic signal equipment. Contractor furnished temporary spares shall be identical to the component being replaced in manufacture, make and model. The Contractor shall deviate from this requirement only upon written advance approval from the City. The Contractor shall provide the temporary equipment at no additional charge to the City whenever the original units are removed for repair or servicing.

The Contractor shall cooperate with the City in recalibrating traffic signal coordination timing and progression.

The Contractor shall change the timing of traffic signals only upon the direction or advance written approval of the City.

During emergency conditions, the Contractor shall assure full cooperation with the City of Sunnyvale Department of Public Safety, the Santa Clara County Sheriff's Department, the California Highway Patrol (CHP) and those employees of the City of Sunnyvale Department of Public Works Division of Transportation and Traffic as indicated.

The Contractor shall ensure that all staff shall obtain Rail Safety certification from Valley Transportation Authority (VTA) and Caltrain allowing them to work in and around VTA and Caltrain track right of way.

The Contractor shall not represent the City of Sunnyvale in matters of policy or procedures under this contract, shall not make any reference to City policy or procedures, and shall refer all questions or inquiries from the public regarding policy and procedures, or terms and conditions of this contract to the City.

The Contractor shall provide traffic control/lane closures that conform to the WATCH manual and/or Caltrans Traffic Manual. For any work impacting bicycle lanes, the Contractor's traffic control/lane closures shall conform to the City of Sunnyvale's Standard Operating Procedure for Bicycle/Pedestrian Safety (Attachment H).

B. FAILURE TO PERFORM

Should the Contractor fail to properly execute the work in a timely or correct matter as provided under the terms of this contract, the City, after providing the Contractor with three business days' notice, may perform or hire another Contractor to perform such work and deduct the cost plus 25% thereof from any payment due to the Contractor.

The Contractor shall provide the City with a written schedule of work within three business days of approval of any repair/service estimate. If the Contractor fails to provide the written schedule, the City shall consider the Contractor to be "failing to perform" a necessary task within a timely matter. The City shall then perform or hire another Contractor to perform such work and deduct the cost plus 25% thereof from any payment due to the Contractor.

C. ROUTINE MAINTENANCE

The Contractor shall enact a continuing comprehensive maintenance program designed to eliminate or reduce any incidence of malfunctions, complaints, and extension of the useful life of the City's traffic signal equipment. The program shall include at a minimum the following:

1. QUARTERLY AND ANNUAL PREVENTIVE MAINTENANCE

The Contractor shall provide quarterly preventive maintenance on the signalized intersections, In-Roadway Warning Lights (IRWL) and Flashing Beacon Systems listed in Attachment B. The Contractor shall complete a Quarterly Preventive Maintenance Checklist (Attachment C, Attachment E, & Attachment F) for each maintenance inspection and shall indicate the minimum work required for each item. The Contractor shall maintain one copy of the completed form for each intersection and for each inspection in the Contractor's business office throughout the term of this contract. The Contractor shall submit with the monthly invoices electronic version of the completed quarterly preventive maintenance forms as part of its monthly activity report. The April and October monthly preventive maintenance inspections shall be conducted at night and shall be considered the semi-annual night-time inspections required under this contract.

The Contractor shall provide annual preventive maintenance of the signalized intersections, In-Roadway Warning Lights (IRWL) and flashing beacons listed in Attachment B. The Contractor shall complete an Annual Preventive Maintenance Checklist (Attachment D, Attachment E & Attachment F), Loop Test (Attachment G), and CMU test reports on Company's Letter Head for each annual maintenance inspection and shall indicate the minimum work required for each item. The Contractor shall maintain one copy of the completed forms for each intersection and for each annual inspection in the Contractor's business office throughout the term of this contract. The Contractor shall submit with the monthly invoices electronic versions of the completed annual preventive maintenance forms as part of its monthly activity report when completed. The Contractor shall submit a schedule for the annual maintenance inspection at the start of the contract. The Contractor shall maintain three copies of the following documents: annual preventive maintenance checklist, the full field test results of the traffic signal conflict monitor, and megger test of traffic loops from the cabinet.. One copy shall be left in the traffic signal controller cabinet, one copy shall be maintained at the Contractor's business office, and one electronic version of the forms shall be sent to the City with the monthly invoice.

The Contractor shall maintain two separate logs at each signalized intersection, flashing beacon systems and IRWL included under this contract. One log shall detail each quarterly and annual preventive maintenance inspection by the Contractor. The Contractor shall complete at a minimum on this log, the inspection date, arrival time, departure time, type of inspection, any findings or repairs, and the Contractor's employee name or ID. The other log shall detail any extraordinary repairs or service calls for the intersection. This log shall detail the nature of the emergency/service call, the Contractor's findings, the repair made, Repair Order number, if applicable, arrival time at the intersection, departure time, and the Contractor's employee name or ID.

It is understood and agreed that failure on the part of the Contractor to perform quarterly and annual preventive maintenance as required by this contract will cause the City to suffer an unascertainable amount of damage. Therefore, the Contractor agrees to pay to the City, not as a penalty but as liquidated damages, the amount of \$500 per calendar day that the intersection is overdue for quarterly or annual preventative maintenance and for failure to provide logs with requested information. The total amount of liquidated damages will be deducted from the monthly invoice payment. Liquidated damages will also be applied for any annual preventive maintenance check not completed by the end of the fiscal year and two annual preventive maintenance checks will be required per location not completed during the following Fiscal Year at no extra charge to the City for the additional annual preventive maintenance check.

2. TRAFFIC SIGNAL CONTROL EQUIPMENT

The Contractor shall repair, replace or otherwise render in good working order any and all defective parts of all traffic signal control equipment. Whenever the Contractor replaces any defective parts on either a temporary and/or permanent basis, the Contractor shall identify the parts being replaced by manufacturer's make and model. Further, the Contractor shall only use new parts for permanent replacement. Exceptions to this requirement shall only occur on an individual basis upon advance written approval from the City.

No permanent changes of traffic signal control devices shall be done without prior written approval from the City. Whenever any traffic signal equipment is removed/replaced/modified, the Contractor shall notify the City by telephone within one hour of the change, followed by written notification to the City within three working days. Furthermore, any changes shall also be indicated on the maintenance or repair log within the traffic signal controller cabinet.

The Contractor agrees to notify, the City in advance of any planned or scheduled traffic signal turn-offs/turn-ons necessitated by the Contractor's operations. The Contractor shall make turn-offs/turn-ons of traffic signals only upon prior written approval by the City. Furthermore, a City representative shall be present at all turn-offs/turn-ons of any traffic signals.

All traffic signal control equipment (poles, in-roadway warning lights, signals, conduits, conductors, camera, loops, UPS systems, and wireless communication systems) shall be maintained in accordance with the manufacturer's recommendations. The Contractor shall bear the cost for replacing any part of the traffic signal control equipment under the provisions of the maintenance program. When the traffic signal control equipment becomes obsolete or deteriorated to the point of being beyond reasonable or cost effective repair, the Contractor shall report such conditions to the City and provide satisfactory evidence that replacements are necessary. The Contractor shall prepare estimates showing the cost breakdown of materials and labor for replacement of such traffic signal control equipment and submit this information to the City.

3. NEW INSTALLATIONS OR DELETIONS

The Contractor shall maintain any new traffic signal equipment, in-roadway warning lights, flashing beacons, and any other related devices, which are installed for or by the City throughout the term of the contract. These devices will be deemed to be added to the existing signalized intersection listed on Attachment B when the City notifies the Contractor of the installation thereof. These added devices, regardless of the complexity of the technology shall be maintained in the same manner and for the same flat rate as those devices already covered by the contract.

In the event notification of the addition of any device is made any day other than the first day of the month, payment for that month shall be prorated from the first day the Contractor is notified to begin maintenance. Should responsibility for the maintenance of any current or future traffic signal device cease to be the City's, the City will notify the Contractor in writing of the last date to perform maintenance. The flat rate maintenance for any such affected device shall be prorated on the basis of the number of days that device was maintained by the Contractor.

4. IN-ROADWAY WARNING LIGHTS

The Contractor shall provide preventive maintenance for all in-roadway warning lights. The same service and maintenance requirements shall exist for in-roadway warning lights as for traffic signals. See attachment E for IRWL PM form.

5. FLASHING BEACONS

The Contractor shall provide preventive maintenance for all flashing beacons. The same service and maintenance requirements shall exist for flashing beacons as for traffic signals. See attachment F for flashing beacon PM form.

6. WARRANTY SERVICE

During the warranty period for any traffic signal, LED, traffic signal controller, communications/monitoring/interconnection device, loop amplifier, video camera, electronic message sign, emergency preemption device, or any traffic signal related device, the Contractor shall be responsible for making contact between the equipment manufacturer, the installing contractor and the City regarding any required service determined to be under warranty. The Contractor shall notify the City of any undue delays in response due to the manufacturer or installing contractor and provide details of each incident.

D. CONTRACTOR SHOP AND EMERGENCY SERVICE

The Contractor shall have established an adequate shop and storage facilities within ten miles travel distance to the intersection of Mathilda Avenue and Olive Avenue. This facility shall house the necessary staff, traffic signal poles, signals, traffic signal controllers, traffic signal communications devices, LEDs, controller cabinets, service cabinets, uninterruptible power supplies, wiring, pullboxes, pullbox lids, and other necessary materials and vehicular equipment to perform all maintenance required and to perform temporary and permanent repair of accident damage to traffic signal equipment/devices. This facility shall also be equipped to perform twenty-one day bench test of traffic signal controller cabinets in accordance to Caltrans and City specifications. This facility shall have all test equipment necessary to test conflict monitors, load switches, flashers, detector amplifiers, controllers, LEDs, and controller cabinets. This facility shall be staffed and open for meetings/inspections at any time Monday thru Friday during normal working hours.

In addition, the Contractor must have access to an adequate amount of fiber optic cabling and have in-house capabilities to be able to complete repairs to existing fiber optic facilities within a 24-hour period. If the contractor fails to repair fiber optic cables within a 24-hour period, the Contractor agrees to pay to the City, not as a penalty but as liquidated damages, the amount of \$500 per day until the fiber optic line is repaired. The total amount of liquidated damages will be totaled and deducted from the monthly invoice payment.

The Contractor shall maintain a single local telephone number during the entire term of the contract where he/she or a designated representative can be reached 24 hours a day, 365 days a year.

The Contractor shall also maintain and provide direct phone numbers, cellular phone numbers, fax numbers, and email addresses of various pertinent staff/employees with which the City can maintain regular and direct contact with regarding billing, estimating, service calls, status reports, scheduling, testing of equipment, and various other issues.

When notified of any traffic signal device malfunction, failure, loss of indication, accident damage, construction damage, or any traffic signal service call, the Contractor shall respond and be at the location within one hour following notification from the City, CHP, or County Sheriff first notifies the Contractor.

In the event of a knockdown, the Contractor shall provide temporary emergency replacement of a type acceptable to the City until permanent repairs can be accomplished. The Contractor shall not reinstall the damaged equipment even if there are no visible signs of damage. Public safety and reliability is of the utmost concern. The Contractor shall install a temporary device appropriate for the situation and consult with the City to identify a permanent replacement. Required replacement of equipment will require prior written approval from the City before such replacements are commenced in conjunction with an emergency call.

The requirement of the previous paragraph will apply except when a pedestrian pushbutton pole or 1B pole is knocked down with no damage to the existing foundation or anchor bolts. In both of these cases, the Contractor shall make a permanent repair with entirely new equipment during the initial service call.

At any time the Contractor is notified of an emergency situation by the City, CHP, or County Sheriff, or other duly recognized authority, the Contractor shall call the appropriate phone number or email the appropriate City staff including Transportation and Traffic personnel of the nature of the emergency call.

Upon completion of the emergency work, the Contractor shall notify the City by telephone and/or email that the emergency work has been completed. In addition, the Contractor shall notify the City in writing within three calendar days that such repairs have been completed.

It is understood and agreed that failure on the part of the Contractor to respond within one hour to any emergency/service call as provided will cause the City to suffer an unascertainable amount of damage. Therefore, the Contractor agrees to pay to the City, not as a penalty but as liquidated damages, the amount of \$500 per call not responded within the one hour requirement. The total amount of liquidated damages will be totaled and deducted from the monthly invoice payment.

The Contractor shall enter any emergency/service call onto the Extraordinary Repair Log at the intersection controller cabinet along with the minimum required information as stated in the previous sections. Failure to do so will be construed to be a failure to respond to the emergency/service call. In this case, the Contractor agrees to pay to the

City, as liquidated damages, the amount of \$500 per emergency/service call not logged and \$500 per hour once the contractor has been notified of the failure to log the emergency/service call.. The total amount of liquidated damages will be totaled and deducted from the monthly invoice payment.

The City shall perform spot checks of the Contractor's response and response times to emergency/service from time to time throughout the term of the contract, through comparison of emergency/service notification time to the Contractor by the City with the arrival time noted in the intersection logs. The City may also choose to randomly time and respond to the emergency/service call along with the Contractor in order to check response times and workmanship of the Contractor.

E. SIGNAL UPGRADES, MODIFICATIONS, AND INSTALLATIONS

The Contractor shall install, modify, and/or upgrade traffic signals and all associated hardware or traffic safety devices as requested by the City. All such work shall be considered extra work and shall be performed to the satisfaction of the City.

No additional or extra work shall be commenced or undertaken by the Contractor unless authorized in advance in writing by the City. Said written authorization is a condition precedent to the Contractor's entitlement to reimbursement or remuneration for such services. Additional or extra work shall be performed in accordance with the most current version of the Caltrans Standard Plans and Caltrans Standard Specifications. This work shall be performed within a specified time limit established by the City and for a mutually agreed upon price.

The City shall retain discretionary right to perform any additional work through the use of City forces, by negotiated agreement, or to advertise such work for construction by others.

F. SAFETY LIGHTS AND INTERNALLY ILLUMINATED STREET NAME SIGNS MAINTENANCE AND REPAIRS

The contractor shall provide maintenance for all Safety Lights and Internally Illuminated Street Name Signs (IISNS). Any replacement of safety lights or IISNS parts found to be damaged while performing quarterly or annual preventive maintenance shall be billed as separate items and as extra work.

The Contractor shall obtain City approval prior to scheduling any work to be performed under this provision. The Contractor shall provide documentation to support invoiced charges, including but not limited to time cards and material invoices, upon request by the City.

G. USA MARK-OUT AND LOCATING SERVICES

The contractor shall provide services to locate and mark traffic signal facilities within 24hr of notification by the City of underground work. USA mark-out and locating services shall be billed as separate item and as extra work.

H. RECORDS

1. PREVENTIVE MAINTENANCE CHECKLIST FORMS

The Contractor shall maintain and provide all required preventive maintenance checklists as described in the previous sections. The Contractor shall provide digital versions of the maintenance checklists monthly to the City along with the Contractor's invoices.

2. COMPUTERIZED MAINTENANCE MANAGEMENT AND INVENTORY SYSTEM

Within thirty days of contract award, the Contractor must have a functioning and deployed comprehensive PC Windows-based, computerized traffic signal maintenance and inventory management system. This system shall be fully functional and implemented. It shall incorporate existing and all historical data for all traffic signals equipment inventory such as controller cabinet and main components, poles and standards, etc., routine maintenance activities, traffic signal "As-Built", trouble spot calls, traffic signal repair activities, and any other relevant data related to the maintenance management and inventory of traffic signals. In addition it shall

incorporate features to produce reports for specific time frames such as weekly, monthly, yearly, etc. for night checks, preventive maintenance checks, traffic signal inventory updates, additions or deletions of traffic control devices, cost estimate and analysis, work order repairs, warranty tracker, remaining service life for the various components of the traffic signal systems, scheduled maintenance and response time. The contractor shall provide and maintain the fully integrated signal database in a GIS model with geographic display and geocoded. All information maintained in the signal database must be available and concurrently updated in the GIS model. . The City, at its option may request revisions or changes to the system to make it acceptable for use. Upon receipt of the City's requested changes/revisions, the Contractor shall ready the system for implementation within three months of the contract award. Any changes to the system requested by the City at this point will be accomplished by the Contractor at no charge to the City and within 30 days of the request. Any future upgrades of the system will be offered by the Contractor to the City at no additional charge during the term of the contract. Upon the end of the contract, the City at its option may retain possession of data in electronic and hardcopy format for future use related to the City's traffic signal maintenance management and inventory.

The City will make available to the Contractor, if needed, traffic signal as-built records that show inventory of all poles and equipment in service at each signalized intersection for integration into the computerized maintenance management and inventory system. The contractor must maintain an on-going schedule for the bar-coding and tagging of all equipment in order to integrate into the system and keep it updated as equipment is removed or upgraded.

The traffic signal maintenance and inventory management system shall provide the following features and equipment at all times:

- a. Intersections - A complete database of signalized intersection In-Roadway Warning Lights, and flashing beacons locations, including all preventive maintenance histories, complete equipment inventory, design/construction as-built drawings in AutoCAD or PDF format,, electronic photo images, repair history and installation date of all equipment utilized at each location. The system should also be GIS compatible.
- b. Assets - Asset inventory, maintenance/repair history, and allow for planned future replacement and budgeting.
- c. Repair/Replacement Parts - Real-time available inventoried replacement parts, current status of reordered equipment, and inventory tracking.
- d. Service/Emergency Calls - A record of all calls, date and time stamp moment of receipt, dispatch, Contractor arrival and departure times. The system shall also have the ability to prioritize all received calls and provide estimated time of arrivals, and corrective actions. All records shall be updated real-time utilizing smart phones or tablets, Palm Pilots, Pocket PCs, handheld scanners or other like products.

Contractor shall provide a demonstration of the fully implemented Traffic Signal Maintenance and Inventory Management System to the City after ninety (90) days of contract award. If the Contractor fails to develop, demonstrate and maintain a functioning system and fails to fully integrate the features mentioned in the previous section during the duration of this contract, the Contractor agrees to pay to the City, not as a penalty but as liquidated damages, the amount of \$1000 per calendar day that the computerized maintenance and inventory management system is not functioning as requested. The total amount of liquidated damages will be totaled and deducted from the monthly invoice payment until it is demonstrated to the City that the system is deployed and all the features such as inventory management, maintenance history, and service/emergency calls status, etc. are fully functional and implemented as requested herein.

3. MONTHLY ACTIVITY REPORT

The Contractor shall submit to the City, at the same time as the submission of monthly invoices, a computerized report covering all Contractor's activities within the City of Sunnyvale during the previous month. This monthly activity report shall be provided in both electronic and hardcopy formats and shall be generated from a database, preferably using Microsoft Access (most recent version). Formatting shall be determined by the Contractor and the City. The Contractor shall be required to maintain a copy of the monthly activity report (either electronic or hardcopy) for a period of not less than five years. The monthly activity report shall include at a minimum:

- a. Time any emergency/service calls were received by the Contractor, time at which the emergency/service call was dispatched to the technician, the arrival time of the technician at the requested location, the length of time spent repairing or diagnosing the problem, and the departure time.
- b. A complete record of any and all work performed on the traffic signal equipment during the period covered by the monthly activity report, including the make, model, and serial number of any replacement or newly installed equipment at each intersection. The report shall also detail the make, model and serial number of any equipment replaced.
- c. The date and time that any preventive maintenance work was performed, including night check reports.
- d. Any and all pending repair work needed at each intersection along with Repair Order number.

I. MEETINGS

The Contractor and any of its staff shall be available to meet, when deemed necessary, with City staff at a mutually agreed upon time and place to review maintenance activities, operational and timing activities, pending work, estimates, work quality, and any items related to Contractor's work under this contract.

J. COMPENSATION

1. QUARTERLY AND ANNUAL PREVENTIVE MAINTENANCE

The Contractor shall be compensated for services required under this contract at a flat rate per intersection.

Included in this flat rate shall be compensation for the preventative maintenance and/or repair of any or all equipment within the traffic signal controller cabinet or signal equipment as identified in Attachments C, D, E and F. Any replacement of traffic signal equipment found to be damaged while performing quarterly or annual preventive maintenance shall be billed as material cost only. Repairs for items found during the regular quarterly preventive maintenance check that take less than 45 minutes to complete shall not be billed as separate item and are included in cost of regular maintenance check.

Not included in this flat rate shall be painting of traffic signal poles, heads, cabinets, labor and material cost for the replacement of inductive loops, pedestrian pushbuttons, replacement of signs, LEDs, or repair to signal equipment when such equipment has been damaged by vehicular collisions, acts of God, or malicious damage.

2. EXTRA WORK

The City shall compensate the Contractor for extra work and repairs in accordance with agreed upon labor rates, material markups, equipment rates, and miscellaneous costs.

Extra work refers to the replacement, repair, upgrade or installation of any device utilized for traffic control or to insure the public's safety. The Contractor shall obtain City approval prior to scheduling any work to be performed under this provision. The Contractor shall provide documentation to support invoiced charges, including but not limited to time cards and material invoices, upon request by the City.

3. PAYMENT AND INVOICES

Payments will be made within thirty days following receipt of an accurate invoice and written verification of work performed by the City's Accounts Payable Unit. The written verification shall be submitted to the City in a format to be approved by the City. Invoices shall have supporting documents to reflect all charges, including but not limited to equipment purchase receipts, time logs, equipment repairs, night checks and repairs, etc. Invoices shall be submitted no more frequently than once per month.

CITY OF SUNNYVALE
List of Signalized Intersections

ATTACHMENT B

Intersection Number	Main Street	Secondary Street
7001	HOMESTEAD ROAD	HOLLENBECK AVENUE
7002	MATHILDA AVENUE	5TH STREET
7003	FREMONT AVENUE	MARY AVENUE
7004	FREMONT AVENUE	HOLLENBECK AVENUE
7005	FREMONT AVENUE	WOLFE ROAD
7006	MARY AVENUE	REMINGTON DRIVE
7007	HOLLENBECK AVENUE	REMINGTON DRIVE
7008	SUNNYVALE SARATOGA ROAD	REMINGTON DRIVE
7009	BERNARDO AVENUE	HEATHERSTONE WAY
7010	FAIR OAKS AVENUE	OLD SAN FRANCISCO ROAD
7011	FAIR OAKS AVENUE	EVELYN AVENUE
7012	FAIR OAKS AVENUE	KIFER ROAD
7013	FAIR OAKS AVENUE	ARQUES AVENUE
7014	FAIR OAKS AVENUE	MAUDE AVENUE
7015	FAIR OAKS AVENUE	DUANE AVENUE
7016	FAIR OAKS AVENUE	CALIENTE DRIVE
7017	MATHILDA AVENUE	MCKINLEY AVENUE
7018	MARY AVENUE	IOWA AVENUE
7019	TASMAN DRIVE	ADOBE WELLS-BIRCHWOOD DRIVE
7020	TASMAN DRIVE	REAMWOOD AVENUE
7021	SUNNYVALE AVENUE	MCKINLEY AVENUE
7022	WASHINGTON AVENUE	PASTORIA AVENUE
7023	MATHILDA AVENUE	WASHINGTON AVENUE
7024	MARY AVENUE	CALIFORNIA AVENUE - BUENA VISTA
7025	KIFER ROAD	PRICE CLUB - COSTCO
7026	HOLLENBECK AVENUE	CASCADE DRIVE
7027	SUNNYVALE AVENUE	WASHINGTON AVENUE
7028	MARY AVENUE	EVELYN AVENUE
7029	EVELYN AVENUE	AGENA WAY
7030	EVELYN AVENUE	FRANCES AVENUE
7031	EVELYN AVENUE	SUNNYVALE AVENUE
7032	SUNNYVALE AVENUE	HENDY AVENUE
7033	EVELYN AVENUE	REED AVENUE

7034	WOLFE ROAD	KIFER ROAD
7035	MATHILDA AVENUE	CALIFORNIA AVENUE
7036	SUNNYVALE AVENUE	ARQUES AVENUE
7037	WOLFE ROAD	ARQUES AVENUE
7038	ARQUES AVENUE	COMMERCIAL STREET
7039	ARQUES AVENUE	SANTA TRINITA AVENUE
7040	SUNNYVALE AVENUE	BORREGAS AVENUE - MAUDE AVENUE
7041	MATHILDA AVENUE	MOFFETT PARK DRIVE
7042	MATHILDA AVENUE	LOCKHEED WAY
7043	MATHILDA AVENUE	JAVA DRIVE
7044	JAVA DRIVE	BORREGAS AVENUE
7045	JAVA DRIVE	CROSSMAN AVENUE
7046	WOLFE ROAD	EVELYN AVENUE
7047	MATHILDA AVENUE	MAUDE AVENUE
7048	SUNNYVALE SARATOGA ROAD	FREMONT AVENUE
7049	EVELYN AVENUE	ASTER AVENUE
7050	MARY AVENUE	THE DALLES AVENUE
7051	MARY AVENUE	HEATHERSTONE WAY
7052	MARY AVENUE	WASHINGTON AVENUE
7053	MATHILDA AVENUE	OLIVE AVENUE
7054	DUANE AVENUE	DE GUIGNE DRIVE
7055	CARIBBEAN DRIVE	MOFFETT PARK DRIVE
7056	WOLFE ROAD	OLD SAN FRANCISCO ROAD
7057	FAIR OAKS AVENUE	CALIFORNIA AVENUE
7058	WOLFE ROAD	INVERNESS WAY
7059	HOMESTEAD ROAD	MARY AVENUE
7061	MATHILDA AVENUE	ROSS DRIVE
7062	FAIR OAKS AVENUE	WOLFE ROAD
7063	MAUDE AVENUE	MACARA AVENUE (N)
7064	HOLLENBECK AVENUE	ALBERTA AVENUE
7065	WOLFE ROAD	MARIA LANE
7066	ARQUES AVENUE	LAKESIDE DRIVE
7067	WOLFE ROAD	CENTRAL EXPRESSWAY
7068	HOMESTEAD ROAD	WRIGHT AVENUE
7069	SUNNYVALE AVENUE	OLIVE AVENUE
7070	SUNNYVALE AVENUE	IOWA AVENUE
7071	PASTORIA AVENUE	IOWA AVENUE

7072	MATHILDA AVENUE	IOWA AVENUE
7073	SUNNYVALE AVENUE	CALIFORNIA AVENUE
7074	FAIR OAKS AVENUE	OLIVE AVENUE
7075	MATHILDA AVENUE	AHWANEE AVENUE - ALMANOR AVENUE
7076	WOLFE ROAD	IRIS AVENUE
7077	SUNNYVALE SARATOGA ROAD	ALBERTA AVENUE - HARWICK WAY
7078	MARY AVENUE	KNICKERBOCKER DRIVE
7079	MARY AVENUE	CASCADE DRIVE
7080	BERNARDO AVENUE	WASHINGTON AVENUE
7081	MARY AVENUE	TICONDEROGA DRIVE
7082	SUNNYVALE SARATOGA ROAD	CHEYENNE DRIVE - CONNEMARA WAY
7083	MATHILDA AVENUE	INDIO WAY
7084	HOLLENBECK AVENUE	DANFORTH DRIVE
7085	MATHILDA AVENUE	SUNNYVALE AVENUE
7086	HOLLENBECK AVENUE	TORRINGTON DRIVE
7087	FREMONT AVENUE	MANET DRIVE - BOBWHITE AVENUE
7088	ARQUES AVENUE	OAKMEAD PARKWAY
7089	FAIR OAKS AVENUE	TASMAN DRIVE
7090	MAUDE AVENUE	PASTORIA AVENUE
7091	FREMONT AVENUE	REMBRANDT DRIVE
7092	JAVA DRIVE	GENEVA DRIVE
7093	STEWART DRIVE	DUANE AVENUE
7094	STEWART DRIVE	SANTA TRINITA AVENUE
7096	IOWA AVENUE	TAAFFE STREET
7097	WASHINGTON AVENUE	TAAFFE STREET
7098	KIFER ROAD	SEMICONDUCTOR DRIVE
7099	KIFER ROAD PEDESTRIAN SIGNAL	
7100	MATHILDA AVENUE	BORDEAUX DRIVE - FIRST AVENUE
7101	JAVA DRIVE	BORDEAUX DRIVE
7102	FAIR OAKS AVENUE	AHWANEE AVENUE
7103	TASMAN DRIVE	VIENNA DRIVE
7104	WOLFE ROAD	STEWART DRIVE
7105	OAKMEAD PARKWAY	LAKESIDE DRIVE
7106	CARIBBEAN DRIVE	BORREGAS AVENUE
7107	REED AVENUE	SEQUOIA DRIVE
7108	MARY AVENUE	MAUDE AVENUE
7109	FAIR OAKS AVENUE	FAIR OAKS WAY
7110	REMINGTON DRIVE	MANET DRIVE

7111	EVELYN AVENUE	BERNARDO AVENUE
7112	MARY AVENUE	CORTE MADERA AVENUE
7113	MATHILDA AVENUE	ROUTE 237 EB ON/OFFRAMP
7114	MATHILDA AVENUE	ROUTE 237 WB ON/OFFRAMP
7115	REED AVENUE	TIMBERPINE AVENUE
7116	CARIBBEAN DRIVE	TWIN CREEKS
7117	HOMESTEAD ROAD	BERNARDO AVENUE - ROUTE 85 ON RAMP
7118	MANILA DRIVE	H STREET
7119	MATHILDA AVENUE	SAN ALESO AVENUE
7120	MOFFETT PARK DRIVE	ROUTE 101 NB ONRAMP
7121	MOFFETT PARK DRIVE	LOCKHEED WAY
7122	OLD SAN FRANCISCO ROAD	GAIL AVENUE
7123	WOLFE ROAD	MARION WAY
7124	CARIBBEAN DRIVE	CROSSMAN AVENUE
7125	HOMESTEAD ROAD	KENNEWICK DRIVE
7126	MATHILDA AVENUE	TENNIS CENTER
7127	HOMESTEAD ROAD	BELLEVILLE WAY
7128	FREMONT AVENUE	WRIGHT AVENUE
7129	ELKO DRIVE	LAWRENCE STATION ROAD
7130	FAIR OAKS AVENUE	IRIS AVENUE
7131	EVELYN AVENUE	MATHILDA OFF-RAMP
7132	REMINGTON DRIVE	BERNARDO AVENUE
7202	TASMAN DRIVE/REAMWOOD DRIVE FLASHING BEACON	
7203	KIFER RD/GORDON FLASHING BEACON	
7204	ARQUES AT FUJITSU PEDESTRIAN CROSSING FLASHING BEACON	
7205	KIFER AT SAN GABRIEL – MAXIM PEDESTRIAN CROSSING FLASHING BEACON	
7301	MAUDE AVENUE/BAYVIEW AVENUE IRWL	
7302	REMINGTON DRIVE/MANGO DRIVE IRWL	
7303	HOLLENBECK AVENUE/HOMESTEAD ROAD IRWL	
7304	BERNARDO AVENUE/BLAIR AVENUE IRWL	
7305	MARY AVENUE/HELENA DRIVE IRWL	
7306	HOLLENBECK AVENUE/HARVARD AVENUE IRWL	
7308	EVYLYN AVENUE/MURPHY AVENUE IRWL	
7309	FREMONT AVENUE/SYDNEY DRIVE IRWL	
7310	REMINGTON AVENUE/SPINOSA DRIVE IRWL	
7311	WRIGHT AVENUE/HELENA DRIVE IRWL	

IRWL – IN-ROADWAY WARNING LIGHTS	

ATTACHMENT C
QUARTERLY PREVENTIVE MAINTENANCE CHECKLIST

Intersection: _____ Number: _____

Date: _____ Start Time: _____ End Time: _____

A. CONTROLLER CABINET/SERVICE CABINET/UPS CABINET	
Appearance – Clean and vacuum cabinet, check and remove graffiti, posters and flyers.	<input type="checkbox"/>
Door Fit, Gasket – Check door closure, plumb, gaskets still good, seal and weather tight.	<input type="checkbox"/>
Lock Operation – Check lock operation. Lube all hinges and locks	<input type="checkbox"/>
Fan Operation – Verify that fan turns on at 90°F and above.	<input type="checkbox"/>
Cabinet Light – Verify that light works with door and light switch, replace cabinet light(s) if necessary	<input type="checkbox"/>
Air Filter Condition – Check air filter, and replace if necessary	<input type="checkbox"/>
Terminal Blocks – Check and tighten all TB for all wires, DLC, interconnect and power.	<input type="checkbox"/>
Documentation Present - Check for logs, timing sheets, manuals and cabinet prints, UPS wiring schematic, manufacturer test results for controller, cabinet and CMU, copy of Annual Preventive Maintenance Checklist and CMU, and Loops results, intersection drawings	<input type="checkbox"/>
<u>Remarks:</u> _____	
B. SIGNAL CONTROLLER	
Controller LEDs Working – Check all LEDs on controller, cards, flasher and load switches. Replace if LEDs not functioning	<input type="checkbox"/>
Controller Display – Check & verify controller display is working.	<input type="checkbox"/>
Timing and Coordination – Verify timing per chart, time set and coordination plan in place.	<input type="checkbox"/>
Phases on Recall – Verify only main street on recall. If not report reason to Traffic Engineer.	<input type="checkbox"/>
Detectors and Loops - Check operation of each detector card per cabinet print and per label on the shelves/DLC	<input type="checkbox"/>
Isolators & Preempt – Check operation of all DC/AC isolators and preempt devices.	<input type="checkbox"/>
<u>Remarks:</u> _____	
C. SIGNAL HEADS	
Lens Condition – Visually check for damage; wipe clean all lenses where necessary.	<input type="checkbox"/>
Lamps and LEDs– Visually check for operation, proper orientation for arrows and seating of LEDs.	<input type="checkbox"/>
3M Program Heads – Check for operation and proper programming.	<input type="checkbox"/>
Signal Heads – Verify all signal heads are aimed properly.	<input type="checkbox"/>

<u>Remarks:</u> 	
D. PEDESTRIAN HEADS	
Aimed correctly – Visually check aiming of pedestrian heads, seating of LEDs, and check audible ped signals.	<input type="checkbox"/>
Lens Condition – Check and clean pedestrian head lens where necessary.	<input type="checkbox"/>
<u>Remarks:</u> 	
E. PEDESTRIAN PUSH BUTTONS	
Placing Calls – Check operation and placing calls of all pedestrian push buttons.	<input type="checkbox"/>
Cover Plates – Check condition of all pedestrian push buttons plates and proper arrow orientation, remove graffiti where necessary..	<input type="checkbox"/>
<u>Remarks:</u> 	
F. MISCELLANEOUS	
Pull Boxes – Check for cracked, chipped and missing pullbox lids, replace if necessary.	<input type="checkbox"/>
Mast Arm Signs – Visually check Mast arm signs for tightness plumb and fading.	<input type="checkbox"/>
UPS System – Check and test operations of UPS system. Deactivate signal power from Service Cabinet before test is initiated.	<input type="checkbox"/>
Event Counter: _____ Hours of Operation: _____	<input type="checkbox"/>
Communications equipment – visually inspect for proper operation, if malfunction noticed notify Traffic Engineer.	<input type="checkbox"/>
Video Detection System – visually inspect for proper operation, if malfunction noticed notify Traffic Engineer.	<input type="checkbox"/>
EMTRAC – Test unit by preempting through the toggle switches, if malfunction noticed notify Traffic Engineer.	<input type="checkbox"/>
Traffic Signal Poles – Check all poles & mast arms for damage, remove graffiti, posters, flyers, correct torque/tightness of anchor bolt nuts.	<input type="checkbox"/>
Traffic Loop Lead-In and Stub-outs – Check for displaced asphalt around detector stub-out and check for coverage of all loop wire in slots, DR where reseal is necessary.	<input type="checkbox"/>
<u>Remarks:</u> 	
TECHNICIAN NAME: _____ SIGNATURE: _____	

DATE COMPLETED:

ATTACHMENT D
ANNUAL PREVENTIVE MAINTENANCE CHECKLIST

Intersection: _____ Number: _____

Date: _____ Start Time: _____ End Time: _____

A. ROADWAY/LOOPS CONDITION

Pavement Condition at loops location - Visually check pavement condition around loops, reseal if necessary.

Excellent ☐ Good ☐ Poor ☐ Cracked ☐ Needs Immediate Attention ☐

Condition of the loops – Megger, test, and record results for all loops, report if any megged less than 10 at cabinet ☐

Detector Cards – Check operation of each detector card per cabinet print and per label on the shelves/DLC ☐

Remarks:

B. CONTROLLER CABINET/SERVICE CABINET/UPS CABINET

Documentation Present - Check for logs, timing sheets, manuals and cabinet prints, UPS wiring schematic, manufacturer test results for controller, cabinet and CMU, copy of Annual Preventive Maintenance Checklist and CMU, Loops test results, intersection drawings. ☐

Ground Fault Interrupter – Check GFI operation ☐

Voltage Level at Entrance – Check and record voltage at terminal.

VDC: _____ VAC: _____ ☐

Controller Settings – Verify timing in controller matches timing sheets. No changes without Traffic Engineer Approval ☐

Controller Cabinet Clean – Vacuum and clean controller cabinet and service. Reseal conduits if necessary ☐

Replace filter, and check operation of the fan. Fan should be set at 90°F ☐

Check for loose and burned terminals – Tighten all DLC's, field wires and other conductors. Replace MOV & noise suppressors if bad or missing. Check breakers, replace if necessary. ☐

Check load switch leakage – Replace if over 5v AC ☐

Conflict Monitor – Test CMU for permissive and overlap operation while in flash and supply report. ☐

Hinges and Locks – Oil and lube hinges and locks for controller cabinet and service ☐

Remarks:

C. AFTER DARK

Traffic Signal – Check signal heads for visibility and operation at night	<input type="checkbox"/>
Pedestrian Signals – Check pedestrian heads for visibility and operation at night	<input type="checkbox"/>
Luminaires – Check luminaires for operation at night	<input type="checkbox"/>
Internally Illuminated Street Name Signs – Check for operation and visibility of all signs, including Guide, Regulatory, and Warning Signs.	<input type="checkbox"/>

Remarks:

D. INFRASTRUCTURE

Condition of Paint – Framework, Signal Heads, Backplates, Cabinet, Service, poles, check paint condition.	<input type="checkbox"/>
Ground Rod Clamp & Wire Present and Secure – Check ground rod & wire in controller cabinet and pullboxes	<input type="checkbox"/>
Hand Hole covers, present and secure – Check hand hole covers for all poles replace if missing	<input type="checkbox"/>
Pull boxes clean & lid in good conditions – Open, check and clean all pull boxes. Replace cracked lids, check and seal all conduits.	<input type="checkbox"/>
Lens – Wipe clean all lenses and check condition of all at signal heads.	<input type="checkbox"/>
Conditions of Splices – Check splices in all pull boxes	<input type="checkbox"/>
LEDs – Visually check all Red, Amber & Green LEDs for light output remove and replace those found defective.	<input type="checkbox"/>
3M Program heads – Check operation, programming and aiming or all signal heads. Ensure louvers are aimed properly.	<input type="checkbox"/>
Signal heads – Check aiming of all signal heads and tighten if necessary. Check, tighten backplates & visors. DR for missing equipment.	<input type="checkbox"/>
Mast Arm Signs & Hardware – Check all signs and hardware for tightness	<input type="checkbox"/>
Relamping of all signals – Relamp bulbs with LED if applicable	<input type="checkbox"/>

Remarks:

D. MISCELLANEOUS

Red Light Detector Devices (a.k.a. Rat Boxes) – Check for burned devices if so remove and replace, clean and tighten if necessary.	<input type="checkbox"/>
Check audible pedestrian indications – Test all units and tighten if necessary.	<input type="checkbox"/>
Video Detection System – Check programming and wiring. Visually check operation of video detection system.	<input type="checkbox"/>

Video Detection Cameras – Check for loose cameras, clean lenses with dampened cloth (water only), ensure images are clear and sharp. If malfunction notify Traffic Engineer.	<input type="checkbox"/>
UPS System – Check and test operations of UPS system, test battery voltage under load and not. Deactivate signal power from Service Cabinet before test is initiated.	<input type="checkbox"/>
Event Counter: _____ Hours of Operation: _____	
MISCELLANEOUS (CONT.)	
EMTRAC – Test devices for operation through the toggle switches. Notify Traffic Engineer if reprogram of unit is needed.	<input type="checkbox"/>
Communication System – Visually check for proper operation of wireless communication equipment & SIC cable.	<input type="checkbox"/>
4-Way flash operation – Test signal operation while on 4-way flash. Visually check flasher for proper operation.	<input type="checkbox"/>
<u>Remarks:</u> _____ _____	
TECHNICIAN NAME: _____ SIGNATURE: _____ DATE COMPLETED: _____	

ATTACHMENT E
IRWL – QUARTERLY/ANNUAL PREVENTIVE MAINTENANCE CHECKLIST

Location: _____

Date: _____ Start Time: _____ End Time: _____

A. CONTROLLER CABINET/SERVICE CABINET

Appearance – Clean and vacuum cabinet, check and remove graffiti, posters and flyers.	<input type="checkbox"/>
Door Fit, Gasket – Check door closure, plumb, gaskets still good, seal and weather tight.	<input type="checkbox"/>
Lock Operation – Check lock operation. Lube all hinges and locks	<input type="checkbox"/>
Terminal Blocks – Check and tighten all TB for all wires.	<input type="checkbox"/>
Documentation Present - Check for logs, timing sheet, manual and cabinet prints, etc	<input type="checkbox"/>

Remarks: _____

B. IN ROADWAY LIGHT FIXTURES AND SIGNS

All lights operational	<input type="checkbox"/>
All push buttons, flashing beacons and LED signs operational	<input type="checkbox"/>
Sweep light fixtures, wipe clean all signs, remove, tape, flyers, posters, or any graffiti if applicable.	

C. ANNUAL CHECK

Open up all fixtures, remove water and dirt.	<input type="checkbox"/>
Ensure weatherproofing seal is in good condition, replace if necessary.	<input type="checkbox"/>
Visually inspect light intensity of LED. If dim replace.	<input type="checkbox"/>
Ensure all splices are in good conditions, re-do where necessary.	<input type="checkbox"/>

Remarks: _____

TECHNICIAN

NAME: _____

SIGNATURE: _____

DATE COMPLETED: _____

ATTACHMENT F
FLASHING BEACON – QUARTERLY/ANNUAL PREVENTIVE MAINTENANCE CHECKLIST

Location: _____

Date: _____ Start Time: _____ End Time: _____

A. FLASHING BEACONS, SIGNS, PUSH BUTTONS AND POLES

All LEDs operational	<input type="checkbox"/>
Ensure all pedestrian push buttons are placing all calls and activating flashing beacons where applicable.	<input type="checkbox"/>
Check condition of all pedestrian push buttons cover plate and proper arrow orientation where applicable.	<input type="checkbox"/>
Mast Arm Signs – Visually check Mast arm signs for tightness plumb and fading where applicable.	<input type="checkbox"/>
Wipe clean all signs, remove, tape, flyers, posters, or any graffiti where necessary and applicable.	<input type="checkbox"/>

B. ANNUAL CHECK

Visually inspect light intensity of LED. If dim replace.	<input type="checkbox"/>
--	--------------------------

Remarks:

TECHNICIAN

NAME: _____

SIGNATURE: _____

DATE COMPLETED: _____



ATTACHMENT G

Annual Preventive Maintenance Loop Test Log

Intersection: _____ Number: _____ Date: _____

Ø1												
	Lane 1			Lane 2			Lane 3			Lane 4		
	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω
	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100
Advance												
Stop bar												
Sampling												
Ø2												
	Lane 1			Lane 2			Lane 3			Lane 4		
	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω
	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100
Advance												
Stop bar												
Sampling												
Ø3												
	Lane 1			Lane 2			Lane 3			Lane 4		

Ø4

	lane 1	lane 2	lane 3	lane 4
--	--------	--------	--------	--------

Ø5

	lane 1	lane 2	lane 3	lane 4
--	--------	--------	--------	--------

[illegible]

	lane 1	lane 2	lane 3	lane 4
--	--------	--------	--------	--------

[illegible]

Stop bar												
Sampling												
Ø7												
	Lane 1			Lane 2			Lane 3			Lane 4		
	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω
	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100
Advance												
Stop bar												
Sampling												
Ø8												
	Lane 1			Lane 2			Lane 3			Lane 4		
	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω
	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100
Advance												
Stop bar												
Sampling												
OLA												
	Lane 1			Lane 2			Lane 3			Lane 4		
	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω
	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100
Advance												
Stop bar												
Sampling												
OLB												

	Lane 1			Lane 2			Lane 3			Lane 4		
	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω
	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100
Advance												
Stop bar												
Sampling												

OLC

	Lane 1			Lane 2			Lane 3			Lane 4		
	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω
	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100
Advance												
Stop bar												
Sampling												

OLD

	Lane 1			Lane 2			Lane 3			Lane 4		
	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω
	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100
Advance												
Stop bar												
Sampling												

	Lane 1			Lane 2			Lane 3			Lane 4		
	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω	µH	Ω	M-Ω
	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100	50<L<700	<5	>100

[illegible]

ATTACHMENT H
CITY OF SUNNYVALE
STANDARD OPERATING PROCEDURES
BICYCLE AND PEDESTRIAN SAFETY THROUGH WORK ZONES

Warning sign types and locations:

- For any lane closures on the right side of the street there will be four required signs.
 1. Road Work Ahead
 2. Right /Bike Lane Closed Ahead (depending on the situation)
 3. A Bike Warning Sign - either W-79, Share the Road, or Watch for Bicyclists. Staff prefers using the Watch for Bicyclists sign.
 4. Lane/Bike Lane Closed (depending on the situation)

Bike lane closures:

- For any bike lane closures there will be four signs required.
 1. Road Work Ahead
 2. Right /Bike Lane Closed Ahead (depending on the situation)
 3. A Bike Warning Sign - either W-79, Share the Road, or Watch for Bicyclists. Staff prefers using the Watch for Bicyclists sign.
 4. Lane/Bike Lane Closed (depending on the situation)
- Staff will try to provide a 14 foot wide travel lane in situations where bicycles and cars will need to share a lane. If this is not achievable, the Caltrans minimum of 10 feet will be required.

Sidewalk closures:

- A clear pedestrian path will be provided through any sidewalk construction.
 1. This could be attained by
 - a) creating a pathway on the sidewalk around the construction, or through the parking strip
 - b) creating a coned or barricaded area off of the sidewalk,
 - c) designating a flagger to escort pedestrians safely through the work zones
 2. If there is no clear pathway immediately available, pedestrians will be detoured. Any detour will include detailed signage. The pedestrian will be notified of the detour before they reached the construction sites so that no backtracking would be required. Elaborate pedestrian detours will be avoided if possible because staff has found them to be ineffective.
- Issues concerning provisions for people with disabilities will be handled on a case by case basis.

Sign placement for work zones that will not be closing any travel lanes:

- Work crews must warn roadway users of the work being conducted on the side of the roadway even when no travel lanes are being closed. In this situation, the warning signs will be placed off of the roadway as much as possible. Bicycle and pedestrian travel will be considered in the placement of the sign. Sign visibility and proximity to the work zone will also be considered.

Duration of work:

- Work crews may use their discretion regarding warning signs and traffic control on jobs that will last under 1 hour. Short duration work is defined as work that occupies a location up to one hour. It is appropriate to use colored or marked vehicles with rotating strobe lights, arrow panels or truck mounted signs in place of advance signs and channelizing devices.

Nighttime visibility :

- Retro reflective 28" cones will be used to barricade work zones at night.
- Barricades with reflective striping will be used to hold warning signs.
- Arrow boards will be used under some circumstances.

- All work being conducted by the city at night will only be done on an emergency basis.

Storage of Equipment on-street:

- No storage of construction equipment or debris is permitted on the street outside of working hours.

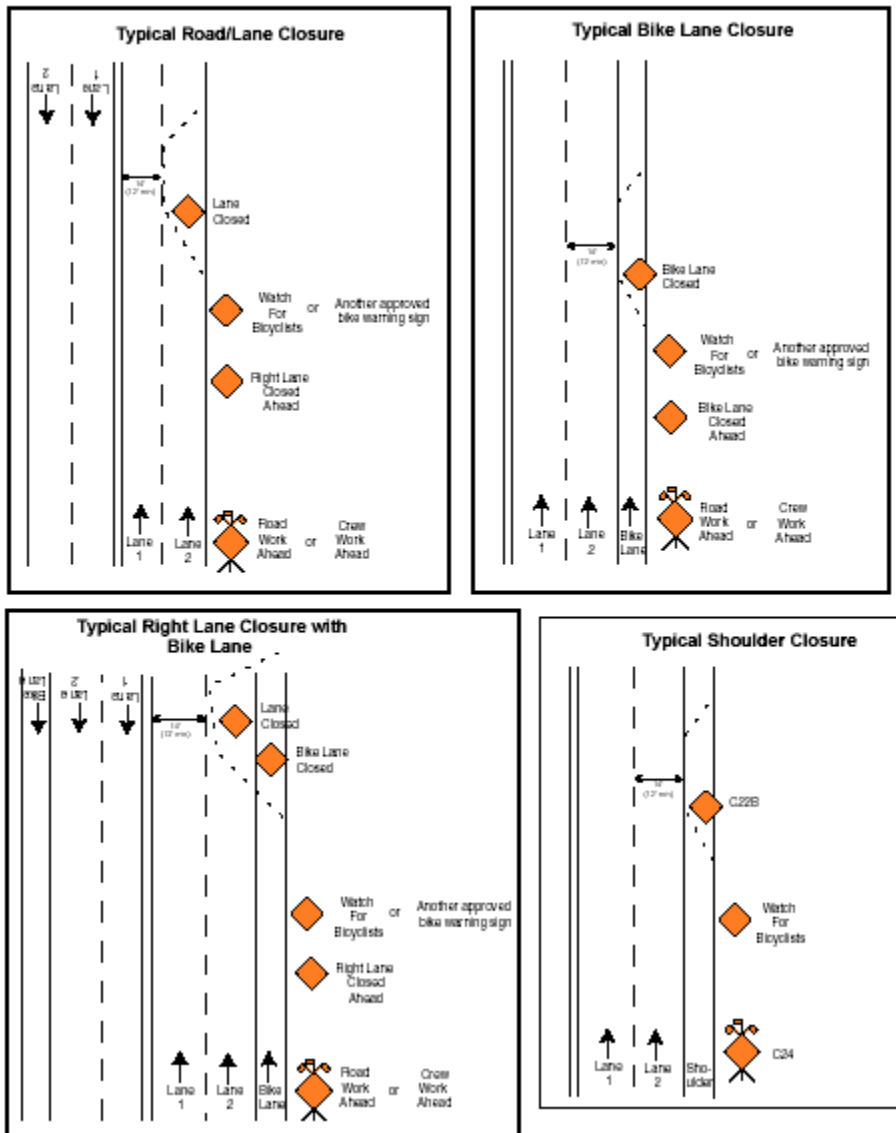
Outside contractor compliance:

- Provide all encroachment permittees with a copy of the city's SOP.
 1. Make contractors aware ahead of time that they will be required to secure their own signs.
 2. Staff will continue to make announcements to sign vendors that the City will be requiring these signs.

Complaint procedures:

- For complaints related to work done by city crews, all complaints will be routed through the "field services" answer point.
- For complaints related to work done for capital projects or by contractors with encroachment permits, all complaints will be routed to the Project Administration division.

City of Sunnyvale
SOP for
Right Lane and Bike Lane Closures



ATTACHMENT I
City of Sunnyvale Traffic Signal Standards

TRAFFIC SIGNAL & LIGHTING:

1.1 DESCRIPTION

Traffic signal and street lighting installation is to be performed at selected locations:

1.2 WARRANTIES

The five- (5) year warranty shall apply to all traffic control equipment listed below:

- Model 170E or 2070 Controllers
- Wireless Communication Hardware
- LED Red, Yellow, Green Vehicle and Pedestrian Signals
- Astro-Brac Vehicle Signal Mounting Hardware
- Detector Amplifiers

The traffic signal UPS system manufacturer shall provide a two (2) year factory-repair warranty for parts and labor on the UPS from date of acceptance by the City. Batteries shall be warranted for full replacement for two (2) years from date of purchase.

In addition all red, yellow, and green ball traffic signal modules, red, yellow, and green arrow traffic signal modules, and pedestrian hand/walking man modules, shall be performance warranted to be in compliance with July, 1998 ITE and CALTRANS minimum intensity standards for LED traffic signal modules, at 74 degrees centigrade, for a period of three (3) years. All warranty related measurements will be made at an applied voltage of 120 volts AC, within one-minute of signal module turn-on.

IISNS LED light engine shall be warranted by the manufacturer for a period of no less than 7 years unconditionally and shall include all costs for labor and materials related to IISNS LED light engine replacement.

The respective manufacturers shall not be responsible for damage caused by negligence by others, acts of God, or use of equipment in a manner not originally intended. To obtain service under this warranty the City will deliver the control equipment to the manufacturer's designated address for repair. The manufacturer will repair and return the control equipment to the City within thirty (30) calendar days.

1.3 FOUNDATIONS

Sleeve nuts shall be used on Type 1-B standards.

Foundations for Type I-B standards shall conform to the details on State Standard Plan ES-6A, "Anchor Bolts with Sleeve Nuts", except that the bottom of the base plate shall be flush with the finished grade.

All anchor bolts shall be grounded and bonded to poles/standards/pedestals.

Ground rod/electrode shall not be embedded into the controller cabinet foundation. It shall be inserted into a sleeve through the concrete foundation into the earth. Contractor shall test the grounding system using appropriate grounding test equipment prior to signal activation. A reading of 25 ohms or less of the grounding system is desirable and acceptable. A written certification or report of this test is required to be provided by the contractor to the city. Test shall be done in the presence of the city assigned inspector.

1.4 STANDARDS AND STEEL PEDESTALS

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

All traffic signal mast arms shall include 1 inch signal ports @ 5 foot intervals installed on underside of mast arm and flexible metal conduit between ports and signal heads.

All unused signal ports shall be plugged with square head pipe plugs.

1.5 PULL BOXES

Grout shall not be placed in bottom of pull boxes.

Where the sump of an existing pull box is disturbed by the Contractor's operations, the sump shall be reconstructed.

No. 3-1/2 pull boxes shall not be used. Contractor shall use a minimum of No. 5 or larger pull boxes unless otherwise indicated on plans.

All traffic signal pullbox lids shall be labeled "CSV Traffic Signal". Traffic signal pullboxes with fiberoptic or communications cables shall have the pullbox lids labeled "CSV Communications" with hold down bolts and be either a N36 with a 12" concrete pullbox extension or N48 with a 10" concrete pullbox extension. N36 pullbox lids shall be Fibrelyte lids. PG&E Type 3 pull box lids shall be labeled "SERVICE".

1.6 CONDUIT

All conduits to be installed across traffic lanes shall be installed using directional boring or open trench as determined by the Contractor. The Contractor shall determine clearance depths for utility crossings prior to conduit installation. Pull boxes shall be located behind the curb or as directed by the Traffic Engineer.

Conduits shall have at least 30" of cover from finished grade in all areas. All conduits shall have a mule tape installed, and a continuous No. 8 insulated solid copper wire for grounding and tracing of conduits.

All conduits shall be sealed with Duct-Seal after wires are installed to prevent moisture and rodents from entering the conduits. All conduit ends within pullboxes shall have bell ends installed.

All conduits entering concrete foundations shall be galvanized rigid steel covered with 10 mil pipe wrap. PVC conduits under roadways shall be Schedule 80. All other shall be Schedule 40.

All conduits shall enter pull boxes from the bottom, not horizontally or between pull boxes and extensions.

1.7 WIRE AND WIRING

Signal cable shall not be used. Conductors and DLC's shall be installed as shown in the Conductor Schedule on the plans.

All conductors shall be spliced in pullboxes using method described in the latest Caltrans Standard Specifications. Wiring for traffic signal indications or equipment shall not be daisy-chained.

All conductors and DLC shall be labeled and identified in each and every pullbox. A minimum of 6 feet (3 feet up and 3 feet down) of service loop shall be provided in each pullbox.

All Loop wire used shall be Type 2 Loop wire and Detector Lead-In Cables (DLC) shall be Type B lead-in cable. The Loop wire shall be suitable for use with Hot-Melt Rubberized Asphalt Sealant. The copper drain wire from the DLC shall be connected to the equipment ground in the controller cabinet. All DLC wires shall be twisted prior to landing on the detector input panel to prevent cross-talk and chatter. All conductors and DLC wire shall have soldered non-insulated spade forks installed in the controller cabinet end.

Hot-Melt Rubberized Asphalt Sealant shall be used to seal all traffic detector loops slots. Asphaltic Emulsion Sealant and Elastomeric Sealant shall not be used.

1.8 SIGNAL INTERCONNECT CABLE

Signal Interconnect Cable (SIC) shall consist of 25 pair No. 22 AWG, minimum, solid, annealed copper conductors. The conductors shall be in twisted pairs, with color-coding to distinguish each pair. Conductor insulation shall be foamed polyolefin with a sold skin of the same material. Conductors shall be twisted into pairs to minimize crosstalk. The cable core shall be filled with a waterproofing compound and wrapped with a non-hygroscopic core tape. A flooding compound shall be applied over the core and to all surfaces of the shield/armor to resist moisture entry and corrosion. The cable shall be finished with a black polyethylene jacket which is sequentially printed with footage markers at regular intervals. Cable shall conform to RUS/PE-89 design.

Splices of the SIC will only be allowed in the traffic signal controller cabinet. Contractor shall terminate SIC in cabinet as indicated in the plans. Contractor shall test the SIC cable for insulation resistance, continuity and distance between the cabinets utilizing an approved copper field tester unit such as the SPIRENT Tech-X Field Tester. The contractor shall furnish a report (Attachment K) showing ohm, megohm, and distance readings per pair to the city Transportation Engineer. For insulation resistance a value of 5 megohm or greater is desirable and acceptable. For continuity test a value of lower than 5 ohms is desirable and acceptable. For distance the value shall be equal to the actual distance of SIC tested. Test shall be performed in the presence of the city Transportation Engineer before connecting to the punchdown block.

1.9 FIBER OPTIC CABLE

FIBER OPTIC CABLE AND EQUIPMENT

This work shall consist of furnishing, installing, and testing of all required fiber optic cable and fiber optic system equipment.

FIBER OPTIC GLOSSARY

Breakout - The cable "breakout" is produced by (1) removing the jacket just beyond the last tie-wrap point, (2) exposing 3 to 6 feet of the cable buffers, aramid strength yarn and central fiberglass strength member and (3) cutting aramid yarn, central strength member and the buffer tubes to expose the individual glass fibers for splicing or connection to the appropriate device.

Connector - A mechanical device used to align and join two fibers together to provide a means for attaching to and decoupling from a transmitter, receiver, or another fiber (i.e., patch panel). See also pigtail definition.

Connectorized - A term that describes the termination point of a fiber after connectors have been affixed. See also pigtail definition.

Couplers - Couplers are devices which mates two fiber optic connectors to facilitate the transition of optical light signals from one connector into another. Couplers may also be referred to as adapters, feed-throughs and barrels.

End-to-End Loss - The maximum permissible end-to-end system attenuation is the total loss in a given link. This loss could be the actual measured loss, or calculated using typical (or specified) values. A designer should use typical values to calculate the end-to-end loss for a proposed link. This number will determine the amount of optical power (in dB) needed to meet the System Performance Margin.

Fan Out Termination - Permits the branching of fibers contained in an optical cable into individual cables and can be done at field locations; thus, allowing the cables to be connectorized or terminated per system requirements. A kit provides pull-out protection for individual bare fibers to support termination. It provides three layers of protection consisting of a Teflon inner tube, a dielectric strength member and an outer protective PVC jacket.

FBC - Fiber Backbone Cable.

Fiber Storage Enclosure (FSE) - Designed for holding excess cable slack for protection. The FSE allows the user flexibility in equipment location and the ability to pull cable back for resplicing.

F/O - Fiber optic.

FOIP - Fiber optic inside plant cable.

FOOP - Fiber optic outside plant cable.

FOTP - Fiber optic test procedures as defined by EIA/TIA standards.

FPC - Fiber Pigtail Cable.

Light Source - A portable piece of fiber optic test equipment in conjunction with a power meter is used to perform end-to-end attenuation testing. It contains a stabilized light source operating at the designed wavelength of the system under test. It also couples light from the source into the fiber to be received at the far end by the receiver.

Link - A passive section of the system, the ends of which are connectorized. A link may include splices and couplers. For example, a video data link may be from video fiber optic transmitter to video fiber optic receiver.

Link Loss Budget - A calculation of the overall permissible attenuation from the fiber optic transmitter (source) to the fiber optic receiver (detector).

Loose Tube Cable - Type of cable construction in which fibers are placed in buffer tubes to isolate them from outside forces (stress). A flooding compound or material is applied to the interstitial cable core to prevent water migration and penetration. This type of cable is primarily for outdoor applications. Cable shall be compliant with Telcordia GR-20 and RDUP PE-90 requirements.

Mid-span Access Method - Description of a procedure in which fibers from a single buffer tube are accessed and spliced to an adjoining cable without cutting the unused fibers in the buffer tube, or disturbing the remaining buffer tubes in the cable.

Optical Time Domain Reflectometer (OTDR) - A fiber optic test equipment similar in appearance to an oscilloscope that is used to measure the total amount of power loss between two points and over the corresponding distance. It provides a visual and printed display of the relative location of system components such as fiber sections, splices and connectors as well as the losses that are attributed to each component and defects in the fiber.

Patch cord - A short jumper used to join two couplers, and or a patch panel and an active optical electronic device.

Patch Panel – Housing for termination of single-mode fibers and storage of splice trays and pigtail fiber optic cables.

Pigtail - Relatively short length of single-mode fiber optic cable that is connectorized on only one end and terminated in an LC-UPC connector at the Manufacturer. Pigtail should be tested for attenuation at three wavelengths (1310 nm, 1383nm, and 1550nm).

Power Meter - A portable fiber optic test equipment that, when coupled with a light source, is used to perform end-to-end attenuation testing. It contains a detector that is sensitive to light at the designed wavelength of the system under test. Its display indicates the amount of power injected by the light source that arrives at the receiving end of the link.

Segment - A section of fiber optic cable that is not connected to any active device and may or may not have splices per the design.

SMFO – Single-mode Fiber Optic Cable.

Splice - The permanent joining of fiber ends to identical or similar fibers.

Splice Enclosure - An environmentally sealed container used to organize and protect splice trays. The container allows splitting or routing of fiber cables from and to multiple locations.

Splice Tray - A container used to organize and protect spliced fibers.

Splice Vault - An underground container used to house excess cable and splice enclosures.

System Performance Margin - A calculation of the overall "End to End" permissible attenuation from the fiber optic transmitter (source) to the fiber optic receiver (detector). The system performance margin should be at least 6 dB. This includes the difference between the active

component link loss budget, the passive cable attenuation (total fiber loss) and the total connector/splice loss.

Tight Buffer Cable – A type of non-breakout cable construction where each glass fiber is tightly buffered (directly coated) with a protective thermoplastic coating to 900 µm with the exception of the protective thermoplastic coating. The tight buffer cable shall meet all the fiber characteristics of the fiber optic outside plant cable specified elsewhere in these specifications.

FIBER OPTIC CABLE

General

Fiber optic cable shall be dielectric, dry filled, loose tube, and suitable for duct installation. Cables shall conform to these special provisions and shall contain single-mode (SM) dual-window (1310 nm and 1550 nm) fibers. Cables shall contain the number of fibers described below and as shown on the plans:

1. Fiber trunkline cables: 96 SM fibers
2. Fiber branch cable: 12 SM fibers

All fiber optic cable of each specific type shall be from the same manufacturer. The manufacturer shall be regularly engaged in the production of fiber optic cables.

The cable shall be an accepted product of the United States Department of Agriculture Rural Electrification Administration (REA) and shall be qualified as compliant with Chapter XV11, Title 7, Part 1755.900 of the Code of Federal Regulations, "REA Specification for Filled Fiber Optic Cables", RDUP PE-90 and Telcordia GR-20 standards.

Fiber optic cable shall be Corning SMF-28E+ single mode, or City approved equivalent.

Fiber Characteristics

Each optical fiber shall be glass and consist of a doped silica core surrounded by concentric silica cladding. All fibers in the cable shall be usable fibers, and shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of these specifications.

The coating shall be a dual layered, UV cured acrylate. The coating shall be mechanically strippable without damaging the fiber. The cable sheath should meet or exceed Telcordia GR-20 and RDUP PE-90 requirements.

The fiber optic cable shall support dense wavelength division multiplexing (DWDM) and shall be zero water peak fiber.

Single-mode fibers within the finished cable shall meet the requirements in the following table:

Fiber Characteristics Table

Parameters	Characteristic
Type	Step Index
Core diameter	8.2 µm (nominal)
Core - Clad Concentricity	≤0.5 µm
Coating Diameter	250 µm ±5 µm
Cladding Non-Circularity defined as: [1 - (Min. cladding diameter ÷ Max. cladding diameter.)] x 100	≤0.7%

Proof/Tensile Test	100 kpsi, Min.
Max. Attenuation: @1310 nm @1383nm @1550 nm	Max Value: 0.35 dB/km 0.35 dB/km 0.25 dB/km
Chromatic Dispersion: Zero Dispersion Wavelength Zero Dispersion Slope	1310 to 1324 nm $\leq 0.092 \text{ ps}/(\text{nm}^2 \cdot \text{km})$
Maximum Dispersion:	$\leq 3.3 \text{ ps}/(\text{nm} \cdot \text{km})$ for 1285 - 1330 nm $< 18 \text{ ps}/(\text{nm} \cdot \text{km})$ for 1550 nm
Cut-Off Wavelength	$\leq 1260 \text{ nm}$
Mode Field Diameter (Petermann II)	$9.2 \pm 0.4 \mu\text{m}$ at 1310 nm $10.4 \pm 0.5 \mu\text{m}$ at 1550 nm

Color Coding

Each fiber shall be distinguishable from others in the same buffer tube by means of color coding according to the following:

- | | |
|----------------|-----------------|
| 1. Blue (BL) | 7. Red (RD) |
| 2. Orange (OR) | 8. Black (BK) |
| 3. Green (GR) | 9. Yellow (YL) |
| 4. Brown (BR) | 10. Violet (VL) |
| 5. Slate (SL) | 11. Rose (RS) |
| 6. White (WT) | 12. Aqua (AQ) |

Buffer tubes containing fibers shall also be color coded with distinct and recognizable colors according to the following:

- | | |
|----------------|-----------------|
| 1. Blue (BL) | 7. Red (RD) |
| 2. Orange (OR) | 8. Black (BK) |
| 3. Green (GR) | 9. Yellow (YL) |
| 4. Brown (BR) | 10. Violet (VL) |
| 5. Slate (SL) | 11. Rose (RS) |
| 6. White (WT) | 12. Aqua (AQ) |

The colors shall be targeted in accordance with the Munsell color shades and shall meet EIA/TIA-598 "Color Coding of Fiber Optic Cables."

The color formulation shall be compatible with the fiber coating and the buffer tube filling compound, and be heat stable. It shall not fade or smear or be susceptible to migration and it shall not affect the transmission characteristics of the optical fibers and shall not cause fibers to stick together.

Cable Construction

The fiber optic cable shall consist of, but not be limited to, the following components:

1. Buffer tubes
2. Central member
3. Filler rods
4. Stranding
5. Core and cable flooding

- 6. Tensile strength member
- 7. Ripcord
- 8. Outer jacket

Buffer tubes - Clearance shall be provided in the loose buffer tubes between the fibers and the inside of the tube to allow for expansion without constraining the fiber. The fibers shall be loose or suspended within the tubes. The fibers shall not adhere to the inside of the buffer tube. Each buffer tube shall contain up to 12 fibers.

The loose buffer tubes shall be extruded from a material having a coefficient of friction sufficiently low to allow free movement of the fibers. The material shall be tough and abrasion resistant to provide mechanical and environmental protection for the fibers, yet designed to permit safe intentional "scoring" and breakout, without damaging or degrading the internal fibers.

Buffer tubes shall contain a homogeneous hydrocarbon-based gel with anti-oxidant additives for water migration resistance per Telcordia GR-20 and RDUP PE-90 standards. The filling compound shall be non-toxic and dermatologically safe to exposed skin. It shall be chemically and mechanically compatible with all cable components, non-nutritive to fungus, non-hygroscopic and electrically non-conductive. The filling compound shall be free from dirt and foreign matter and shall be readily removable with conventional nontoxic solvents.

Buffer tubes shall be stranded around a central member by a method that will prevent stress on the fibers when the cable jacket is placed under strain, such as the reverse oscillation stranding process.

Central member - The central member functions as an anti-buckling element. It shall be a glass reinforced plastic rod with similar expansion and contraction characteristics as the optical fibers and buffer tubes. A linear overcoat of Low Density Polyethylene shall be applied to the central member to achieve the optimum diameter to provide the proper spacing between buffer tubes during stranding.

Filler rods - Filler rods may be included in the cable to maintain the symmetry of the cable cross-section. Filler rods shall be solid medium or high density polyethylene. The diameter of filler rods shall be the same as the outer diameter of the buffer tubes.

Stranding - Completed buffer tubes shall be stranded around the over-coated central member using stranding methods, lay lengths and positioning such that the cable shall meet mechanical, environmental and performance specifications. A polyester binding shall be applied over the stranded buffer tubes to hold them in place. Binders shall be applied using tension sufficient to secure the buffer tubes to the central member without crushing the buffer tubes. The binders shall be nonhygroscopic, non-wicking (or rendered so by the flooding compound), and dielectric with low shrinkage.

Core and cable flooding - The cable core interstices shall be filled with a polyolefin based compound to prevent water ingress and migration. The flooding compound shall be homogeneous, non-hygroscopic, electrically non-conductive, and non-nutritive to fungus. The compound shall also be nontoxic, dermatologically safe and compatible with all other cable components.

Tensile strength member - Tensile strength shall be provided by high tensile strength aramid yarns or fiberglass which shall be helically stranded evenly around the cable core and shall not adhere to other cable components.

Ripcord - The cable shall contain at least one ripcord under the jacket for easy sheath removal.

Outer jacket - The jacket shall be free of holes, splits, and blisters and shall be medium density (MD) or high density (HD) polyethylene (MDPE or HDPE), or medium density cross-linked polyethylene with a suitable minimum nominal jacket thickness. Jacketing material shall be applied directly over the tensile strength members and flooding compound and shall not adhere to the aramid strength material. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

The jacket or sheath shall be marked with the manufacturer's name, the words "Optical Cable", the number of fibers, "SM", year of manufacture, and sequential measurement markings every meter. The actual length of the cable shall be within -0/+1 percent of the length marking. The marking shall be in a contrasting color to the cable jacket.

GENERAL CABLE PERFORMANCE SPECIFICATIONS

The cable shall comply with the optical and mechanical requirements over an operating temperature range of 40°C to +70°C. The cable shall be tested in accordance with EIA 455 3A (FOTP 3), "Procedure to Measure Temperature Cycling Effects on Optical Fiber, Optical Cable, and Other Passive Fiber Optic Components." The change in attenuation at extreme operational temperatures (40°C to +70°C) for single-mode fiber shall not be greater than 0.20 dB/km, with 80 percent of the measured values no greater than 0.10 dB/km. The single-mode fiber measurement is made at 1550 nm. The cable performance requirements shall be in conformance with Telcordia GR-20 and RDUP PE-90 standards.

The required fiber grade shall reflect the maximum individual fiber attenuation, to guarantee the required performance of each and every fiber in the cable over the entire operating temperature range of the cable.

PACKAGING AND SHIPPING REQUIREMENTS

Documentation of compliance to the required specifications shall be provided to the Engineer prior to ordering the material.

Attention is directed to "Fiber Optic Testing," elsewhere in these special provisions.

The completed cable shall be packaged for shipment on reels that are lagged. The outer part of the reel shall be covered with wood or some type of hard material that cannot be penetrated by a fork lift truck or some other large sharp object used in loading and off loading the reels. The cable shall be wrapped in a weather and temperature resistant covering. Both ends of the cable shall be sealed to prevent the ingress of moisture.

Each end of the cable shall be securely fastened to the reel to prevent the cable from coming loose during transit. On each end of the cable, 6.6 feet of cable length shall be accessible for testing.

Each cable reel shall have a durable weatherproof label or tag showing the manufacturer's name, the cable type, the actual length of cable on the reel, the Contractor's name, the contract number, and the reel number. A shipping record shall be provided to the Engineer in a weatherproof envelope showing the above information and also include the date of manufacture, cable characteristics (size, attenuation, bandwidth, etc.), factory test results, cable identification number and any other pertinent information.

The minimum hub diameter of the reel shall be at least 30 times the diameter of the cable. The fiber optic cable shall be in one continuous length per reel with no factory splices in the fiber. Each reel shall be marked to indicate the direction the reel should be rolled to prevent loosening of the cable.

Cable damaged during packaging and shipping shall be replaced by the Contractor without additional compensation.

Each reel of singlemode fiber shall come with a set of OTDR and optical loss test set (OLTS) readings. The OLTS readings shall be from a Fluke or Agilent hand held device.

FIBER OPTIC CABLE INSTALLATION

General

The cable manufacturer shall provide installation procedures and technical support concerning the items contained in this specification. The Contractor shall provide the Engineer with two copies of the cable manufacturer's installation instructions for figure eight cable and fiber optic cable conduit. All installation shall be in accordance with these practices except as otherwise directed by the Engineer. Additional cable costs due to damage caused by the Contractor's neglect of recommended procedures shall be the Contractor's responsibility.

The Contractor shall submit the following to the Engineer for approval prior to installation of the fiber optic cable.

- List of equipment used for installation
- Cable pulling plan with tension calculations
- Cable Testing plan and loss budget

Fiber optic cable shall be installed in continuous runs without splices except where specifically allowed on the plans, or where cable type changes. The manufacturer's recommended limits for cable pull lengths shall not be exceeded. Cable ends shall be stored in pull boxes immediately adjacent to cabinets or as directed by the Engineer.

All fibers in cable buffer tubes shall also be installed in continuous runs. If authorized by the Engineer, intermediate splices shall be made in approved splice enclosures. At intermediate splices, all fibers shall be spliced. Under no conditions shall single-mode fibers be cut out or spliced at intermediate points without written direction from the Engineer.

Cable shall be installed in conduit or duct in the field in accordance with the contract drawings. The conduit and duct ends shall have all rough edges smoothed to prevent scraping the cable. Contractor shall brush out and mandrel through each section of conduit before cable installation. A manufacturer recommended lubricant shall be applied to the cable to reduce friction between the cable and duct or conduit. Where fiber optic cables are to be installed in inner duct, the Contractor shall secure each section of inner duct to prevent it from being pulled with the cables. All conduit runs shall have a minimum #12 AWG solid copper conductor placed inside for locating purposes.

A cable grip shall be attached to the cables so that no direct force is applied to the optical fiber. The cable grip shall have a ball-bearing swivel to prevent the cable from twisting during pulling. Cable rollers and large 18-24 inch diameter sheave feeders and winch cable blocks shall be used to guide the cable freely into the duct and at maintenance hole locations. Mechanical aids and pulling cables or ropes shall be used as required.

Where mechanical pulling is required (i.e. all runs greater than 150 feet), a dynamometer shall be used to record installation tension and a tension limiting device shall be used to prevent exceeding the maximum pulling tension as defined by the cable manufacturer. The maximum pulling tension shall be recorded for each run of cable. The cable shall be taken up at intermediate pulling points with an intermediate cable take-up device as approved by the Engineer to prevent over-tension on the cable. Cable pulls shall be continuous and steady between pull points and shall not be interrupted until the entire run of cable has been pulled. The Contractor shall provide pulling tension calculations at all pulling points to the Engineer for his review and approval.

Contractor shall be responsible for ensuring the cable length is sufficient to allow for connection between the communications equipment and the splice enclosures (if applicable) including provision for slack, vertical runs, cable necessary for splicing, wastage and cable to allow for the removal of the splice enclosure for future splicing.

Where backbone or spur cable runs are left to be "dead ended," a minimum of 50 feet of cable shall be left coiled in the final cabinet, manhole, or pull box, unless otherwise called for in the plans.

Contractor shall provide to the Engineer for his review and approval a list of the OTDR, fusion splicer, and OLTS equipment along with calibration certifications that are not more than 6 months old. The Contractor shall provide a loss budget, OTDR sample shot and OLTS sample with the loss budget loaded into the instrument for the Engineer to approve the resolution of the results.

Fiber Optic Cable Labeling

The fiber optic cable shall be clearly tagged and labeled as such at all pull box locations and at all other locations where it is exposed. Labeling shall consist of a stainless steel engraved tag attached to the cable sheath with stainless steel tie wraps, typically 316 stainless. The label shall have the words "Fiber Optic Cable." Labels shall be affixed to the cable per the manufacturer's recommendations and shall not be affixed in a manner that will cause damage to the fiber. Handwritten labels shall not be allowed. The Contractor shall provide a fiber cable ID scheme that provides the information on the end points of the fiber and the type of glass that is in the fiber.

Cable Splicing

Field cable splices shall be done either in splice vaults or in cabinets as shown on the communication schematic diagram sheet in the Contract plans. Fiber Optic Cable shall be from the same manufacturer on both sides of the splice.

Unless otherwise allowed, the cable splices shall be fusion type. The mean splice loss shall not exceed 0.07 dB per splice. The mean splice loss shall be obtained by measuring the loss through the splice in both directions and then averaging the resultant values.

The mid-span access method shall be used to access the individual fibers in a cable for splicing to another cable as shown on the plans. Cable manufacturers recommended procedures and approved tools shall be used when performing a mid-span access. Only the fibers to be spliced may be cut. All measures shall be taken to avoid damaging buffer tubes and individual fibers including those not being used in the mid-span access.

The field splices shall connect the fibers of the two cable lengths together. These splices shall be placed in splice trays and these splice trays shall then be placed in the splice enclosure. The splice closure shall be Preformed Line Products Coyote Runt series, or approved equivalent.

The termination splices shall connect the cable span ends with pigtails. The termination splices shall be placed in splice trays and the splice trays shall then be placed in the patch panel unit.

Splice trays must accommodate a minimum of 12 fusion splices. The individual fibers shall be looped at least one full turn within the splice tray to avoid micro bending. A 2-inch minimum bend radius shall be maintained during installation and after final assembly in the optical fiber splice tray. Each bare fiber shall be individually restrained in a splice tray. The optical fibers in buffer tubes and the placement of the bare optical fibers in the splice tray shall be such that there is no discernable tensile force on the optical fiber.

All splices shall be protected with a metal reinforced thermal shrink sleeve.

FIBER OPTIC CABLE ASSEMBLIES

Cable assemblies (jumpers and pigtails) shall be products of the same manufacturer. The cable used for cable assemblies shall be made of fiber meeting the performance requirements of these special provisions for the fiber optic cable being connected.

Pigtails

Pigtails shall be of simplex (one fiber) construction, in 900 μm tight buffer form, surrounded by aramid for strength, with a PVC jacket with manufacturer identification information and a normal outer jacket with diameter of 0.12 inch. Single-mode cable jackets shall be yellow in color. All pigtails shall be factory terminated and tested and at least 3 feet in length.

Patch cords

Patch cords may be of simplex or duplex design. Duplex jumpers shall be of duplex round cable construction, and shall not have zip-cord construction. The patch cord shall be terminated with a compatible super physical contact single-mode connector at both ends. The fiber strands shall meet the specifications of the fiber cable and the connectors shall meet the specifications as specified elsewhere in these special provisions. All patch cords shall be at least 6 ft in length, sufficient to avoid stress and orderly routing.

The outer jacket of duplex patch cords shall be colored yellow. The two inner simplex jackets shall be color coded white and slate, respectively, to provide easy visual identification for polarity.

Fiber Optic Cable Connectors

All fiber optic cable connector types shall be compatible with the connection requirements of the Ethernet switch, patch panel, or other communication equipment to which the cables are connected.

The connector operating temperature range shall be -40°C to $+70^{\circ}\text{C}$. Insertion loss shall not exceed 0.4 dB and the return reflection loss on single-mode connectors shall be at least 40 dB. Connection durability changes shall be less than 0.2 dB per 500 mating cycles per EIA-455-21A (FOTP-21). All terminations shall provide a minimum 50 lb-force pull out strength. Factory test results shall be documented and submitted to the Engineer prior to installing any of the connectors.

FIBER OPTIC PATCH PANEL

The Contractor shall furnish and install a cabinet side wall-mounted termination enclosure. Optional guard and dust proofing components shall be included. The patch panels shall have a sufficient number of connection panels to handle the associated fiber terminations. The capacity to secure and store the required splice trays and break out cables shall also be provided.

The housing shall have a front cover that shall be easily removed or opened by use of a hinge and/or fastened with thumbscrews to provide easy access for cable installation. The bottom and/or back shall provide openings for cable entrance, and provide for strain relief at each entrance point. The housing shall provide fixtures as required to maintain the fiber optic cables at more than the minimum bending radius without strain placed on the cable.

The patch panel shall include an Altos filled and flooded pre-terminated ribbon fiber cable stub long enough to extend from the controller cabinet to the fiber optic splice vault.

The fiber optic patch panel shall be Corning Cable Systems Pretium series 1RU enclosure PR1-12-13-12-A9- -W4-00-1-B

FIBER OPTIC TESTING

General

Testing shall include the tests on elements of the passive fiber optic components: (1) at the factory, (2) after delivery to the project site but prior to installation, (3) after installation but prior to connection to any other portion of the system, and (4) during final system testing. The active components shall be tested after installation. The Contractor shall provide all personnel, equipment, instrumentation and materials necessary to perform all testing. The Engineer shall be notified two working days prior to all field tests. The notification shall include the exact location or portion of the system to be tested.

Documentation of all test results shall be provided to the Engineer within 5 working days after the test involved.

A minimum of 15 working days prior to arrival of the cable at the site, the Contractor shall provide detailed test procedures for all fields testing for the Engineer's review and approval. The procedures shall include the tests involved and how the tests are to be conducted. Included in the test procedures shall be the model, manufacturer, configuration, date and operating procedures.

Factory Testing

Documentation of compliance with the fiber specifications as listed in the Fiber Characteristics Table shall be supplied by the original manufacturer. Before shipment, but while on the shipping reel, 100 percent of all fibers shall be tested for attenuation with an optical power meter and light source. Copies of the results shall be (1) maintained on file by the manufacturer with a file identification number for a minimum of seven years, (2) attached to the cable reel in a waterproof pouch, and (3) submitted to the Contractor and to the Engineer.

Arrival on Site

The cable and reel shall be physically inspected on delivery by the Contractor. The Contractor shall use a bare fiber adapter and test one strand in each buffer tube and compare it to the factory test results.

The Contractor shall test the fibers via an OTDR to confirm that the cable meets requirements. Reel testing shall be performed using bare fiber adaptors. Single-mode fibers (SM) shall be tested at 1310 nm and at 1550 nm. Test results shall be recorded, dated, compared and filed with the copy accompanying the shipping reel in a weather proof envelope. The test results shall be at the resolution approved by the City. Prior to testing the cable, the Contractor shall coordinate with the Engineer for the names to use for each trace. The Contractor shall provide to the City Inspector a licensed copy of the software needed to read the OTDR traces on a Microsoft based workstation.

Attenuation deviations from the shipping records greater than 5 percent shall be brought to the attention of the Engineer. The cable shall not be installed until completion of this test sequence and the Engineer provides written approval. Copies of traces and test results shall be submitted to the Engineer. If the test results are unsatisfactory, the reel of fiber optic cable shall be considered unacceptable and all records corresponding to that reel of cable shall be

marked accordingly. The unsatisfactory reels of cable shall be replaced with new reels of cable at the Contractor's expense. The new reels of cable shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

Fiber Optic System Gain Margin

The installed system gain margin shall be at least 6 dB for each and every link. If the design system gain margin is less than 6 dB, the Engineer shall be notified and informed of the Contractor's plan to meet that requirement. Test results shall be recorded and submitted to the Engineer for approval.

Testing Of Interconnecting Parts

All of the components of the passive interconnecting parts (patch panels, pigtails, couplers and splice trays) shall be from a manufacturer who is regularly engaged in the production of the fiber optic components described, such as Corning Cable Systems, or approved equivalent.

Each termination shall be tested for insertion attenuation loss with the use of an optical power meter and source. In addition, all single-mode terminations shall be tested for return reflection loss. These values shall meet the loss requirements specified earlier and shall be recorded on a tag attached to the pigtail or jumper.

Once interconnecting assembly is complete, the Contractor shall visually verify that all tagging, including loss values, is complete. Then as a final quality control measure, the Contractor shall do an "end to end" optical power meter/light source test from pigtail end to jumper lead end to assure continuity and overall attenuation loss values.

Documentation

The final test results shall be recorded, along with previous individual component values, on a special form assigned to each patch panel. The completed form shall be dated and signed by the Contractor's supervisor. One copy of this form will be attached in a plastic envelope to the assembled patch panel unit. Copies will be provided separately to the Contractor and to the Engineer.

Before the final testing is conducted, the visual inspection process shall consist of the Contractor using a scope that can take digital color pictures of the face of every connector ferrule. Each of these images needs to be named with a file name that associates it with the OTDR trace and OLTS attenuation test.

A loss budget needs to be submitted by the Contractor based on the loss tolerances specified in the Contract documents. The loss budget shall be comprised of the glass loss, the connector loss, and the splice loss. These shall all be stated individually in the loss budget and loaded into the OLTS individually. The OLTS report shall show the budget attenuation for an optical segment connector to connector and the actual loss. The test report shall indicate the quantity of splices, footage of fiber and the number of mated connector for each pair of fibers. An OTDR trace of the same links shall accompany the OLTS and visual inspection photos and be set at a resolution that clearly shows the splices and connectors as well as the length of cable accurately.

System Verification at Completion

Once the passive cabling system has been installed and is ready for activation, 100 percent of the fiber links shall be tested with the OTDR for attenuation at both wavelengths. Test results shall be recorded, dated, compared and filed with previous copies. A hard copy printout and an electronic copy of the traces and test results along with a licensed copy of the associated

software on a minimum 4 GB USB version 2.0 Flash Drive or a Secure Digital (SD) card shall be submitted to the Engineer. If the OTDR test results are unsatisfactory, the link shall be replaced at the Contractor's expense. The new link shall then be tested to demonstrate acceptability. Copies of the test results shall be submitted to the Engineer.

Attenuation tests shall be performed with an OTDR capable of recording and displaying anomalies of 0.02 dB as a minimum. Single-mode fibers shall be tested at 1310 nm and at 1550 nm. Attenuation readings shall be recorded on a cable data sheet showing factory and after installation results.

The OTDR shall have a printer capable of producing a verifying test trace with fiber identification as shown in Appendix A "Link Loss Budget Work Sheet," numerical loss values, the date and the operator's name.

The "Link Loss Budget Work Sheet" shown in Appendix A shall be completed for each link in the fiber optic system, using the data gathered throughout the installation process. The completed work sheets shall be included as part of the system documentation.

The "Total System Gain" shall be calculated by subtracting the measured "Optical Receiver Sensitivity" (line 1B on the "Link Loss Budget Work Sheet") from the measured "Optical Transmitter Average Power" (line 1A), which were obtained using a power meter and source. The resulting difference shall be the maximum allowable loss between the transmitter and the receiver, within 0 percent to +10 percent of the manufacturer's specified loss budget for the transmitter/receiver pair. The "Total System Gain" shall be recorded on line 1C.

The "Fiber Losses" for a link shall be calculated by multiplying the length of the fiber link (line 2A) by the normalized cable attenuation (dB/km, line 2B) at the operating wavelength. The normalized attenuation for this calculation shall be the maximum value throughout the operating temperature range of the cable. The product shall be recorded on line 2C.

The total connector losses shall be calculated by summing the individual attenuation values for each connector pair in the link, excluding the transmitter and receiver connectors. The sum shall be recorded on line 2D.

The total splice losses shall be calculated by summing the individual attenuation values for each splice in the link. The sum shall be recorded on line 2E.

The total of other losses shall be calculated by summing the individual attenuation values for each component in the link not previously addressed. The sum shall be recorded on line 2F. These items may include, but are not limited to, couplers, splitters, routers and switches.

The "Total System Loss" shall be recorded on line 2G of the "Link Loss Budget Work Sheet."

The "Design System Gain Margin" shall be calculated by subtracting the "Total System Loss" (line 2G) from the "Total System Gain" (line 1C). The resulting difference shall be recorded on line 3A. The Contractor's attention is directed to "Fiber Optic System Gain Margin," elsewhere in these special provisions.

At the conclusion of the final OTDR testing, 100 percent of all fiber links shall be tested end to end with a power meter and light source, in accordance with EIA Optical Test Procedure 171 and in the same wavelengths specified for the OTDR tests. These tests shall be conducted in both directions. Test results shall be recorded, compared and proven to be within the design link loss budgets, and filed with the other recordings of the same links. Test results shall be submitted to the Engineer.

If during any of these system verification tests, the results prove to be unsatisfactory, the fiber optic cable will not be accepted. The unsatisfactory segments of cable shall be replaced with a new segment of cable at the Contractor's expense. The new segment of cable shall undergo the same testing procedure to determine acceptability. Copies of the test results shall be submitted to the Engineer. The removal and replacement of a segment of cable shall be interpreted as the removal and replacement of a single contiguous length of cable connecting two splices, two connectors, or a splice and a connector. The removal of only the small section containing the failure and therefore introducing new unplanned splices will not be allowed.

Link Loss Budget Worksheet

Contract No. _____

Contractor: _____

Approved by Caltrans: _____

Date: _____

Operator: _____

Link Number: _____

Fiber Color: _____

Buffer Color: _____

Cable #: _____

Test Wavelength (Circle one): 1310 nm 1550 nm

Section 1: Total System Gain

Measured Optical Transmitter Average Power: _____ dBm 1A

Measured Optical Receiver Sensitivity
(This should be a negative value): _____ dBm 1B

Subtract line 1B from 1A to obtain Total System Gain: _____ dB 1C

Section 2: Total System Loss

Measured length of the link: _____ km 2A

Measured loss per km of the fiber: _____ dB/km 2B

Multiply line 2A by 2B to obtain the Total Fiber Loss: _____ dB 2C

Sum of all Connector Losses in the link: _____ dB 2D

Sum of all Splice Losses in the link: _____ dB 2E

Sum of all Other Losses from other components
(Couplers, splitters, routers, switches, etc.): _____ dB 2F

Add lines 2C, 2D, 2E and 2F to obtain Total System Loss: _____ dB 2G

Section 3: Design System Gain Margin

Subtract line 2G from line 1C
(This number must be at least 6 dB): _____ dB 3A

MANAGED FIBER OPTIC ETHERNET SWITCH, 100/1000 MBPS

Managed Fiber Optic Ethernet switches in the communications subsystem shall have 100/1000Base-LX uplink ports that transfer data from the intersections within the fiber optic network to the TOC. This data shall include data from traffic signal controllers and encoders associated with the fixed video detection cameras.

The Managed Fiber Optic Ethernet network switch shall be an ACTELIS ML530, or City-approved equal.

Actelis ML530 Network Switch Specifications

Switch Requirements

The supplied material for this project shall be a DSL switch assembly, model ML530 by Actelis Networks. This assembly shall include the (1) ML530 switch, (1) ML Power Supply, and (1) 19" Rack Mount Chassis (for 332/336 cabinet installations). The ML530 shall have the capability to offer Ethernet services over fiber in both an inbound and outbound direction (2 SFP interfaces) supporting also linear add drop networking.

The Actelis traffic interlink network element (network element) is required to operate on existing fiber facilities that are part of the traffic interlink communications network. The network element shall support up to 1000Mbps Ethernet over fiber. The SFP ports are 100/1000BaseFX ports. The fiber interfaces can be used as WAN/LAN or as part of a fiber ring.

In addition to the 2 SFP ports, the switch must offer a minimum of (4) 10/100 Layer 2 managed Ethernet ports, and (1) 10/100 Management Port.

All operating parameters described above must be contained in a one RU high housing and capable of supporting two network elements with all of the functionality included in this document in one Rack unit.

Installation and setup of the Actelis ML530 switch must be performed by a factory trained technician.

Integrated Ethernet Switching Capabilities

Each network switch shall include an integrated Ethernet switch capable of providing four 10/100 ports to communicate with various devices within a traffic controller cabinet and one port for local management. One of the SFP ports can also be used for connection to different equipment within the traffic cabinet. The integrated Ethernet Switch shall also offer the following Local Area Network capabilities:

- Dynamic Bridging IEEE 802.1, 8K MAC address
- VLAN Tagging IEEE 802.1Q
- Double Tagging Q-in-Q, VMAN
- RSTP, STP IEEE 802.1d
- OAM/CFM IEEE 802.3ah, IEEE 802.1ag, ITU Y.1731

Quality of Service

- Classes of Service 4
- Scheduler WFQ, SP
- Classification L2 802.1p/Q priorities
- L3 ToS/DiffServ

Integrated Optics

Each network element has (2) optical interface operating up to a 100/1000Mbps line rate. The optical port is available via a SFP optical plug in module and be capable of working in conjunction with both 4-port high speed copper links. The ML530's Small Form Factor (SFP) ports support a large variety of optical interfaces to accommodate short and long distances as needed per applications. DS3/E3 uplinks can be used to connect to legacy networks, offering Ethernet over DS3 utilizing a 100/1000Base-FX SFPs port, as well.

Installation

The Actelis ML530 is a hardened, RoHS 6 compliant compact unit that is ideal for deployments in outside plants, remote cabinets. The unit shall be rack mounted.

Network Management

In order to support ease of operation and the lowest possible on-going operating expense the Actelis ML530 network elements can be managed In- and Out-of-Band by the MetaASSIST™ View graphical craft application and via the multi-platform Element Management System, The Actelis MetaASSIST EMS . The EMS solutions can be located at the Traffic Operations center or any other appropriate location. The management protocols include standard command line interface and SNMP using standard MIBs for seamless integration with third-party Network Management Systems (NMS).

The Actelis ML530 ensures a high level of security, enabling safe and protected communication that supports SSH, Radius as well as and additional advanced capabilities.

Management Protocols

- SNMP v1 and v2c
- Command Line Interface TL1
- Remote Access Telnet
- Secure Access (option) SSH v2
 - Time Synchronization SNTP v3
 - Web Access HTTP
 - File transfer FTP, TFTP
 - User Authentication: RADIUS and/or local passwords

Management Applications

- EMS: MetaASSIST™ EMS
- Craft GUI: MetaASSIST™ View

Front Panel Indicators (LEDs)

- Power
- Status
- Alarm
- ACT (Activity) per Ethernet port
- LNK (Link) per Ethernet port

Physical

Dimensions:

- Height: 1.6" / 40mm (1U),

- o Depth: 11.0" / 280mm,
 - o Width: 8.4" / 213mm
 - Weight: 3.75 lbs / 1.7 Kg
 - Mounting
 - o Rack: 2 units in 19" racks
 - o Desktop,
 - o Wall Mount
 - Power DC: -48/-60 VDC nominal, 11 Watt,
 - Power AC: 90-264 VAC, 47-63 Hz, 17-21 Watt
- Safety**
- UL 60950, CSA C22.2 60950
 - ETSI EN 60950, IEC 60950
- EMC**
- FCC Part 15 Class B
 - ICES-003 Class B
 - ETSI EN 300 386 Class B
 - ETSI ETS 300 132-2
- NEBS**
- Level III (GR-1089-CORE, GR-63-CORE)
- NEMA**
- Rated -40 to +74 C

1.9 SERVICE

Type III-AF service equipment enclosures shall be the aluminum type. Service Cabinet shall be powder coated the same color as the traffic signal controller cabinet at the factory, Sunnyvale Beige with Anti-Graffiti Coating, color code Beige #TCIP009-BG02. The contractor shall submit a paint chip for approval by the Traffic Engineer.

All overlapping exterior seams and doors shall meet the requirements for Type 3R enclosures specified in the NEMA Enclosure Standards. Continuous welding of exterior seams in service equipment enclosures is not required.

Type III-AF service equipment enclosures shall be configured and wired as shown on the plans or in the State of California Department of Transportation Standard Plans, May 2011, Std. Plan ES-2D, Page 431, also one (1) additional 30Amp unmetered Street Lighting breaker wired to Test switch, PEU control, and 60Amp Contactor.

Service cabinet shall incorporate the UPS system within the service cabinet or mounted to the rear of the service cabinet. Of mounting to the service cabinet, the cabinet shall be assembled as the factory (see Section 1.20).

Ground rod/electrode shall not be embedded into the service cabinet foundation. It shall be inserted into a sleeve through the concrete foundation into the earth. Contractor shall test the grounding system using appropriate grounding test equipment prior to service activation. A reading of 25 ohms or less of the grounding system is desirable and acceptable. A written certification or report of this test is required to be provided by the contractor to the city. Test shall be done in the presence of the city assigned inspector.

1.10 SIGNAL HEADS

All traffic signal heads shall be furnished with red, yellow, and green LED's. The Contractor shall furnish all indications for traffic signal units.

The traffic signal housing doors, full circle visors and backplate shall all be painted black. The traffic signal housing shall be painted olive green. No plastic/polycarbonate traffic signal heads will be allowed.

1.11 SIGNAL HEAD MOUNTINGS

Adjustable Astro-Brac vehicle signal mounting hardware with terminal compartments, or equivalent, shall be provided for mast arm signal heads as noted on the plans.

Mast arm signals and mast arms shall include signal ports @ 5 foot intervals and flexible metal conduit between ports and signal heads. Contractor shall install enough flexible metal so that each signal head can be adjusted/moved 4 feet left or right of each signal port.

All unused signal ports shall be sealed with a square head pipe plug.

All signal mounting assemblies including pipe fittings, post-top slip fittings, and terminal compartments shall be cast bronze.

1.12 RED LIGHT ENFORCEMENT UNITS

The Red Light Enforcement units shall be used for enforcement by continuously monitoring the red light status of specific traffic signal indications as indicated on the plans. The units shall consist of the following minimum specifications:

- Utilize Omni-View technology for the LED indications.
- Viewable up to 200 feet under normal conditions.
- LEDs indications shall consist of red LEDs for through direction monitoring and blue LED's for left turn direction monitoring.
- Operate on 110 volts from the traffic signal conductors without use of external power supplies or transformers and shall have replaceable inline fuse for overload.
- Shall include a universal signal port mounting which allows adjustments up to 360 degrees in a horizontal plane and up to 215 degrees in the vertical plane.
- The barrel shall be constructed of welded 5052 grade aluminum.
- Unit shall be painted and powder coated black
- All hardware for installation shall be provided.
- Spade connectors for connection of standard traffic terminal signal blocks shall be provided.
- Shall come with a two (2) year warranty on all parts.

The Red Light Enforcement units shall be the Enforcer manufactured by McCain Traffic Supply or approved equal.

1.13 VIDEO DETECTION SYSTEM

The video detection system will be a modular system that shall plug into the I or J detector rack of a Caltrans type 170 controller cabinet.

The Video Detection System must be field programmable without the use of an auxiliary computer system. (Keypads, pointing devices, and video monitors are acceptable support equipment but must be included with the system as required.)

The System shall permit direct (no supplementary interface equipment) recording of video detection operation (background image plus detector zone status) using a standard video recorder from a panel jack on the video detector.

The System shall include provisions for field adjustment of camera zoom and focus. The Video Detection System shall be furnished with a Lens Adjustment Module or other camera adjustment equipment specifically designed for use with the furnished system. (Systems that permit camera zoom and focus adjustment of a pole-mounted camera from the traffic signal controller cabinet are preferred.)

The System shall allow for archival and external storage of detector programming parameters (this may be achieved through the usage of an external computer system). The System shall be capable of storing three detector configurations on the video processor module.

The System shall be furnished with a color LCD flat panel monitor with a minimum 17" diagonal measure. The 17" LCD monitor shall fold flat into a pull out tray when not in use. The LCD monitor shall be provided with each system to provide local video display at the intersection for use during system setup, programming, and maintenance.

Each camera installation shall include two separate surge protection assemblies. One for AC input power and one for video input signals and shall be furnished on a single panel using standard DIN rail mounted components. The system must provide adequate filtering of power by use of circuit breakers and video signals by use of Edco video surge suppressors to eliminate negative effects of nearby sources of electromagnetic interference and line spikes.

Cameras used for video detection system shall be color cameras. Black and white cameras shall not be used.

Camera mounts shall be powder coated to match the color of the camera housing. Both shall be powder coated White. All camera mounts shall be universal in design and provide for horizontal (mast arm) mounting or vertical (pole shaft) mounting unless otherwise noted on the plans. Universal camera mounts shall be manufactured by the video detection system manufacturer.

Cameras will be mounted on the traffic signal mast arm, centered over the approach being

detected The System manufacturer shall conduct a field visit to verify final camera positioning and possible need for placement on the traffic signal mast arm and use of a vertical riser & mounting system to reliably and accurately detect desired traffic for stop bar and advance detection.

All cable connectors and terminations shall be positively retained and shall withstand a minimum 25-lb. Pull test with no loss of electrical or mechanical integrity.

Each installation shall include a video detection equipment list (including product serial numbers). All video detection equipment shall be new and unused. The manufacturing date of the material furnished shall be no more than 6 months prior to installation.

Each camera shall have a separate power source and circuit protection device of appropriate amperage. The circuit protection devices shall be installed in the traffic signal controller cabinet.

Cable splices between the camera and the traffic signal controller cabinet are not allowed, unless otherwise approved by the Transportation Engineer.

All power, grounding, and electrical neutral connections shall be made to the terminal busses provided in the traffic signal controller cabinet.

All exposed wiring and cables shall be "drip looped" for outdoor service.

All exposed electrical connections shall be rain tight.

Video detection system shall be provided with an addressable Ethernet module that shall compress detection camera video to mpeg4 format for remote viewing of camera images and remote programming of detection system.

The contractor shall arrange to have a technician, qualified to work on the video detection system and employed by the Video detection manufacturer or his/her representative present to setup and configure the System. The City Transportation Engineer shall be notified prior to completion of Video Detection System installation at the intersection. All Video Detection System equipment installation, cable termination, connections, camera alignment procedures, system setup, configuration, and programming of detector zones shall be completed prior to or during the pre turn-on work.

The Video Detection System shall be successfully running during the seven (7) day operational test prior to the scheduled turn-on. Further adjustment during the signal turn-on shall not be required.

The manufacturer shall supply two sets of operation and installation manuals.

The Video Detection System shall be provided with a standard 3 year warranty.

The manufacturer shall supply one additional color camera, camera mounting system, 17" LCD rack mounted video monitor, single camera processor, and two channel extension modules for

use as spare equipment per signalized intersection constructed.

1.14 INDUCTIVE LOOP DETECTORS

All detector amplifiers shall include LCD displays that indicate complete status and function setting of the detector including: loop frequency, loop inductance, delta L over L percent values, accumulated number of loop failure incidents since last reset, and a bar graph that displays inductance change to verify ideal sensitivity level setting. All detector amplifier functions shall be fully programmable from the front LCD menu. The detector amplifier shall be able programmable to emit an audible tone during detector activation.

The Contractor shall furnish and install one loop detector amplifier for each detector designation (i.e., 111U and 111L).

Where one detector consists of a sequence of 4 loops in a single lane, the front loop closest to the limit line or crosswalk shall be Type D and located one foot from the line. All loops shall be connected in series unless otherwise indicated on the plans.

Detector and Detector Lead-In Cable (DLC) Testing and Acceptance - The Contractor shall test all individual loops and all DLCs prior to splicing. Inductive loops. All DLCs shall be tested for continuity, inductance and for insulation resistance using a standard multimeter for continuity and an approved loop test meter for inductance and insulation resistance. For continuity test a value of lower than 5 ohms is desirable and acceptable. For insulation resistance test a value of greater than 100 megohms is desirable and acceptable. Inductance shall be more than 50 but less than 700 micro-henries. Test shall be performed in the presence of the city Transportation Engineer before any splices are made. See Attachment G for loops test log.

1.15 PEDESTRIAN SIGNALS

The Contractor shall supply and install Type A pedestrian signals.

All pedestrian signals shall be furnished with a combination Portland Orange "Up-Raised Hand", and Lunar White "Walking Man" LED's. All pedestrian indication symbols shall be completely filled in, outlined indications shall not be allowed. LED Pedestrian indications shall also have a Portland Orange "Countdown Indication" showing the remaining Walk/Don't Walk time. Unit shall have uniform appearance symbols that exceed ITE PTCSI-2 requirements.

The Countdown Pedestrian Signal shall be user configurable through dipswitches allowing the user to deactivate the countdown operation or activate countdown of Walk+Don't Walk time, countdown of Walk time and then Don't Walk time and countdown of Don't Walk time only.

Countdown display shall feature 2-row 9" high countdown digits that are MUTCD compliant for crosswalks over 100 feet. Countdown shall be fully preemption compatible, and revert to it's previous timing immediately following a preemption call. Display shall have memory feature to allow countdown timing to be stored internally, even when power is off for extended time. Unit shall automatically adjust to traffic signal controller pedestrian interval changes. Unit shall be

sealed for moisture resistance, lens shall be textured to reduce glare, and quick connect terminals and spade adapters shall be provided. Units shall be ENERGY STAR qualified.

Typical wattage at 25°C shall be 5 watts for countdown display, 8 watts for hand display, and 6 watts for person display. The minimum luminance shall be 1400cd/m² for countdown and hand display and 2200cd/m² for person display. Unit shall operate within the voltage range of 80VAC to 135VAC with 120VAC nominal. Power factor shall be greater than 0.9 and total harmonic distortion shall be less than 20%. Turn on/turn off time for hand/person shall be 75msec maximum and operating temperature range shall be -40°C to +74°C. Unit shall meet FCC Title 47, Subpart B, Section 15 Regulations for electrical noise. Unit shall conform to MIL-STD-810F for blowing rain, MIL-STD-883, Test Method 2007 for mechanical vibration, MIL-STD-883, Test Method 1010 for temperature cycling requirements. The Luminance uniformity and color uniformity shall exceed ITE PTCSI-2 LED Pedestrian Signal Specification requirements. Transient suppression shall exceed ITE PTCSI-2 LED Pedestrian Signal Specification and meet the following standards: NEMA TS-2 Sec 2.1.6 and 2.1.8, IEC 1000-4-5, 3KV, 2ohn source impedance, and ANSSI/IEEE C62, 41-2002; IEC 61000-4-12, 6KV, 200A, 100KHz ring wave. All units shall be traceable by serial number for warranty and manufacturing date purposes. All supplied LED pedestrian signal units shall be manufactured within 6 months of installation date.

Pedestrian LED signal shall e Dialight 430-6479-001X or approved equal.

Type SP-1-T mountings shown on the State Standard Plan ES-3B shall have a lower mounting bracket attached to the pedestrian signal housing in the same manner as the SP-2-T mounting.

The pedestrian signal housing and mounting bracket shall be powdercoated olive green and the pedestrian housing door and z-crate shall be powdercoated black.

The contractor shall ensure that the pedestrian signal frameworks provided will have enough clearance from the shaft of the traffic signal pole to allow proper aiming and access to the pedestrian signal for maintenance.

1.16 PEDESTRIAN PUSH BUTTONS

All pedestrian push button assemblies shall be Type B (5" x 7.5") per State Standard Plan ES-5C. Pedestrian push button signs shall be the R10-3 Series (5" x 7.5"). Pedestrian push buttons shall be 2" ADA pushbuttons and be mounted 36" above the adjacent pavement. Pedestrian pushbutton assembly and housing shall be powder coated olive green from factory. Pedestrian push buttons shall have LED indication and audible speaker on pushbutton body to indicate activation of pushbutton. Pushbutton shall be Polara Navigator Accessible Pedestrian Signal (APS) or City-approved equivalent. The push button shall be a vibratory and tactile unit with a raised directional arrow and shall be as follows:

- Vibrator Power: 15 VDC
- Speaker: 8 ohms, 15 W max, weather proof
- Temperature Range: -40 Celsius to +105 Celsius
- Push Button: ADA compliant connects to control unit in parallel with traffic signal

- controller connection.
- LED: Sunlight visible, red.
- The control unit shall be as follows:
 - Power Supplied to Vibrator: 15 VDC pulsed. Operates during walk interval only.
 - Conflict Detection: WALK indication is ignored in the event of a WALK/DON'T WALK conflict.
 - Audio Amplifier Power Output: 10 W RMS into 8 ohms.
 - Volume Control: Control unit provides separate volume controls for setting locator tone and walk message volumes.
 - Volume Control Automatic Adjustment Range: 28 dB max.
 - Microphone For Ambient Noise: Approximate frequency range: 170 Hz to 2.3 kHz
 - Push Button Interface: Accepts 12 to 48 V AC/DC imposed by connection to push button in parallel with existing traffic signal controller.
 - LED Operation: The LED lights when button is pushed. The LED remains lit until the next walk phase.
 - Push Button Tone: A brief "tick" confirms each button push.
 - System Programmable Options shall include: Cuckoo, Peep-Peep, Walk Message, Selectable Walk Sound Duration, Location Message, Extended Push Activation, Locating Tone and Custom Street Name Message.
 - "Cuckoo" North-South audible signal (Electronic Bird Chirp) by method of two (2) combined frequencies. Duration of 0.6 seconds +/- 20%. Frequency base on 1,100 Hz +/- 20% with frequency deviation +120 Hz +/- 20%.
 - "Peep-Peep" East-West audible signal (Electronic Bird Chirp) by method of two (2) combined frequencies. Duration of 0.2 seconds +/-20%. Frequency base of 2,800 Hz +/- 20% with frequency deviation -800 Hz +/- 20%.
 - Audible locating tone. Duration of 0.1 seconds +/- 20%. Frequency base of 800 Hz +/- 20% plus harmonic.
- Testing of each Tactile Pedestrian Push Button with Combined Audible Unit shall be as follows:
 - Apply power to the WALKING PERSON/UPRAISED HAND pedestrian signal head.
 - Manually feel the arrow on the push button during the WALKING PERSON interval – a very noticeable vibration should be detected.
 - Manually feel the arrow on the push button panel during the UPRAISED HAND interval – there should be no noticeable vibration.
 - If the location beep option is used, it should sound every 3-seconds once power is applied.
 - The Custom Walk Message should sound during the same time the "arrow" is vibrating.
 - The "Voice of Location Parameter" should sound when the button is pushed and held for about 4-seconds.

All pedestrian pushbutton plates shall be secured to the pedestrian pushbutton assembly with 8-32 x 3/8" button head torx tamperproof stainless steel screws.

All 2" ADA pedestrian pushbuttons shall be secured to the pedestrian pushbutton assembly with 8-32 x 1" or other appropriate length button head torx tamperproof stainless steel screws.

The contractor shall provide two (2) torx tamperproof keys to the City.

1.17 PHOTOELECTRIC CONTROLS

Contactors shall be the mechanical armature type.

Photoelectric control shall be installed in accordance with Section 86-6 of the State Standard Specifications.

The contractor shall supply a photoelectric control unit to be used as a spare.

1.18 INTERNALLY ILLUMINATED STREET NAME SIGNS

The Contractor shall supply and install Type A IISNS double faced in accordance with the State of California, Department of Transportation, Standard Plan ES-7P and Standard Specification 86-6.09, and these Special Provisions:

The Contractor shall supply and install Hawkins Adjustable IISNS brackets or Pelco Adjustable IISNS brackets. The Contractor shall also supply and install a safety cable to secure and support IISNS in case of failure of brackets.

All IISNS panels shall include the street name, block numbers with directional arrows, cardinal direction where applicable and the City of Sunnyvale logo. The IISNS panel shall not have any white border visible around the outer edges of the face, the entire panel shall be green except for lettering, block numbers, cardinal direction, and Sunnyvale logo. IISNS panel font shall be Series EM with eight inches (8") in height upper case letters, six inches (6") in height lower case letter, three inches (3") in height block number, cardinal direction and directional arrow, and ten inches (10") by thirteen inches (13") City of Sunnyvale Logo. Contractor shall provide samples of sheeting material and a paper plot to the City Transportation Engineer prior to the fabrication of the sign.

The sign faces shall be fabricated from flexible, colored, wide-angle prismatic retro reflective sheeting tape and related processing material designed to enhance the visibility of the traffic control signs. The retro reflective sheeting for sign faces/finished signs shall have a smooth surface with a distinctive interlocking diamond seal pattern and orientation marks visible from the face. The sheeting shall be preaccepted with a pressure sensitive adhesive backing protected by a removable liner. The adhesive shall require no heat for proper bonding when applied in accordance with the manufacturer's recommendations to substrates 65 degree F or above. The retro reflective sheeting shall be 3M™ Diamond Grade™ Translucent DG White Sheeting #4090T, the green sheeting shall be 3M ElectroCut™ Film Green #1177, the yellow, blue, and black used in the Sunnyvale City logo shall be ElectroCut™ Film Yellow #1171, Blue #1175 and Black (opaque) #1178, respectively.

IISNS shall be illuminated with an LED light system. No fluorescent tubes shall be used.

The LED light system is to be Plug & Play with no modification to the IISNS housing, panels shall be available in 4' increments, LED panel face shall be entirely conformally coated with a 2-part

urethane resin, no thinner than 0.002 inches (dry) to protect the light engine from moisture and corrosion. Power supply shall be U.L Class 2 (24VDC) rated and damp location rated. The entire IISNS sign panel shall be evenly illuminated with the minimum surface luminance being 200 cd/m² with variance no more than +/- 20%. LED light engine shall be warranted for 7 years from manufacturer.

1.19 MODEL 170E OR 2070 CONTROLLER ASSEMBLIES

All controller assemblies shall be furnished by the Contractor and shall include Model 170E controllers unless 2070 controller are specified in the plans.

The controller cabinet shall be powder coated the same color as the Type III-AF service cabinet at the factory, Sunnyvale Beige with an Anti-Graffiti Coating, color code Beige #TCIP009-BG02. The contractor shall submit a paint chip for approval by city Transportation Engineer. Contractor shall supply one can of spray touch-up paint matching, Cardinal Industrial Finishes Beige #TCIP009-BG02 with Anti-Graffiti Coating to repair any minor paint damage to the controller cabinet or service cabinet during installation.

All controller assemblies shall conform to Section 86-3.01 of the State Standard Specifications. All controller cabinet prints shall indicate the following wiring and equipment modifications. The first two paragraphs of that section are amended to read as follows:

The controller assemblies shall consist of a Model 170E or 2070 controller unit, a fully wired cabinet and all auxiliary equipment required to control the system as shown on the plans, as specified in these Technical Specifications and as specified in Sections 86-3.01, "Controller Assembly" also including four (4) low profile fluorescent lighting fixtures (front/back of cabinets), a Siecor Rack-Mount Fiberoptic Splice Enclosure, a pullout drawer/shelf, red monitor board and cable capable of monitoring vehicle and pedestrian phases, C2 communications cable and C5 cable. The traffic signal controller cabinet shall have 2 hooks welded inside the front door and back door used to hang a factory supplied resealable document holders. A resealable document holder shall be supplied for each door. All controller cabinet doors shall have Normally Closed switch installed for the purpose of "Door Open" alarm, switches shall be wired so that opening of any door shall activate an input to lower channel of J11. Upon completion of circuit, DC isolator shall output a signal to controller indicating "Door Alarm". Upper channel of J14 shall be wired to the "On-Battery and Low Power Output" of the UPS system. This shall cause controller cabinet to force intersection to Flashing Red operation upon loss of Utility Power and Low Battery condition from UPS using Railroad 1 input. Controller cabinet shall be supplied with Model 242DC isolator for slots J11 and J14.

Rack-Mount Fiberoptic Splice Enclosure shall accommodate up to 12 splices of fiberoptic cable with ST connectors. Enclosure shall be mounted between PDA#2 power supply and Output Bay. The enclosure shall not interfere with access or wiring to rear of PDA and Output Bay.

Model 170E controller assemblies shall conform to the requirements in "Traffic Signal Control Equipment Specifications," issued by the State of California, Department of Transportation, and to all addendums thereto current at the time of project advertising.

Attention is directed to Section 209-2.42 "Conductor Identification" of the *City of Sunnyvale Standard Specifications for Public Works Construction 2000 Edition and Standard Details for Public Works Construction 2000 Edition*.

Controller units shall be furnished with the latest version BiTran Traffic Signal Program 233 and 412/C Memory Module. Controllers shall be furnished with the necessary modems for interconnection and for dial-up to the existing City of Sunnyvale BiTran QuicNet system. Internal modems for the traffic signal controller shall be capable of communicating at a 9600-baud rate. Modem shall be GDI-496 modem or approved equal.

If 2070 traffic signal controllers are specified, units shall be furnished with the latest version of software for 2070 controllers. 2070 controllers shall be furnished with a Field I/O Module(2070-2A), C1 connector for 170 controller cabinets, C11S connector, a 8 line x 40 character backlit LCD display panel(2070-3B), 10 Amp power supply module(2070-4A), 2 Asynchronous serial communications ports(2070-7A), an Ethernet port connection, and the necessary modems for interconnection and for dial-up to the existing City of Sunnyvale BiTran QuicNet system capable of communicating up to a 9600-baud rate(2070-1E). 2070 traffic signal controllers shall conform with the latest CALTRANS TEES and Errata. 2070 controllers will be supplied with the latest version of BiTrans 2033 or Transcore ITS SCATS software unless otherwise indicated on the plans. 2070 controller shall be supplied with a SFK5V 2M datakey.

Controller cabinet shall also be supplied with fused/surge protected a minimum 6 outlet power strip mounted to power panel or other approved area within controller.

If specified in the plans, the traffic signal controller cabinet shall be supplied with an Ethernet Bridge operating on G.SHDSL.BIS with 8 DSL ports supporting M-Pair, bandwidth of 5.7 Mbps per DSL pair, 4 port managed Ethernet switch, bridging (Full bridging support with DSL port bundle configuration) VLAN support, dynamic and static routing, RSTP and remote management (Telnet and SNMP with SSH support.) Ethernet Bridge shall be approved by the Transportation Engineer prior to any deployment. Ethernet Bridge shall be secured to 19" rack underneath the traffic signal controller and over the pullout 17" LCD monitor.

All supplied traffic signal controllers shall have a manufacture/assembly date of not more than 6 months prior to start of 21-day cabinet testing. Contractor shall provide paperwork documenting this from traffic signal manufacturer.

The controller cabinet shall be provided with a modular 66 terminal punchdown blocks (66M 50 block with bridging clips) with a separate standoff extension mounting bracket and panel to secure to the controller cabinet assembly.

Ground rod/electrode shall not be embedded into the concrete controller cabinet foundation. It shall be inserted into a PVC sleeve through the foundation into the earth. The Contractor shall test the grounding system using appropriate grounding test equipment prior to signal pre turn-on. A reading of 25 ohms or less of the grounding system is desirable and acceptable. A written certification or report of this test is required to be provided by the contractor to the city. Test shall

be done in the presence of the city assigned inspector.

The supplier of the Traffic Control Equipment is required to furnish engraved plastic labels to be installed on all conductors in the bottom of the controller cabinet by the Contractor's field personnel.

The Contractor shall arrange to have a minimum of five (5) representatives present at the time the traffic signal equipment is turned on: A technician, qualified to work on the controller unit and employed by the controller unit manufacturer or his representative, a cabinet technician, qualified to work on the controller cabinet and employed by the controller cabinet manufacturer or his representative, and a Transcore SCATS engineer/representative if SCATS software is used, a technician qualified to work on the traffic signal service/UPS units employed by the service/UPS unit manufacturer and his representative, and a traffic signal technician from current Traffic Signal Maintenance Contractor. The contractor shall be responsible for all cost associated with each technician/manufacture's representative required for activation of the traffic signal.

Contractor is responsible to contract for Sunnyvale Department of Public Safety Police Officers for traffic control for signal activation. Public Safety requires a minimum of three weeks notification prior to signal activation. Contractor is responsible for all related costs to this item.

1.20 TRAFFIC SIGNAL CONFLICT MONITOR

The traffic signal conflict monitor shall be configured for operation with 170E, 179, or 2070 traffic signal controller. The monitor shall provide the following functions in addition to those requirements set forth in the Caltrans Traffic Signal Control Specifications: enhanced functions of Red signal monitoring, dual indication monitoring, clearance monitoring, pedestrian phases "Walk& Don't Walk" monitoring and provide a RYG full intersection display, provide a RS232 port to communicate with the traffic signal controller or personal computer, and store monitor status, event logs, and signal sequence history logs in nonvolatile memory for diagnostic and archival purposes. A communications cable shall be provided to allow communication between the traffic signal conflict monitor and the traffic signal controller through the RS232 ports. The traffic signal conflict monitor shall also have an Ethernet Port for remote monitoring. The traffic signal conflict monitor shall be capable of operating as an 18 channel conflict monitor with a 18 channel diode card and as a 16 channel conflict monitor with a 16 channel diode card. Traffic signal conflict monitor shall be Reno A&E 2018-G or approved equal.

1.21 TRAFFIC SIGNAL UPS SYSTEM

The traffic signal UPS system (UPS) shall include, but not be limited to the following: inverter/power transfer relay, with a maximum transfer time of 150 milliseconds, batteries and charging circuitry, a separate manually operated non-electronic bypass switch and all necessary hardware and interconnect wiring. The UPS shall provide reliable emergency power to a traffic signal in the event of a power failure or interruption. The UPS shall be capable of providing power for full run-time operation for an "LED-only" intersection (all colors red, yellow, and green). The UPS shall be designed for outdoor applications, in accordance with the Caltrans Transportation Electrical Equipment Specifications (TEES), dated November 19, 1999, Chapter 1, Section 8 requirements.

The UPS shall be installed and tested by an authorized UPS manufacturer representative prior to the start of the 21-day controller assembly test. The Contractor shall arrange to have a manufacturer representative, qualified to work on the UPS and employed by the UPS unit manufacturer or his authorized representative, present at the time the equipment is turned on.

UPS unit shall be provided with optional external data/event logger.

Enclosure Specifications

The enclosure shall be aluminum; powder coated Sunnyvale beige (Cardinal Industrial Finishes #TCIP009-BG02) with Anti-Graffiti Coating and be weatherproof. The enclosure shall house UPS batteries. Enclosure shall be TIG welded construction with welding materials specifically designed for the material to be welded. Enclosure shall have frames side hinged outer doors with swaged close tolerance sides for flush fit with drip lip and closed cell neoprene flange compressed gaskets. Front door shall incorporate a full length piano hinge, pad-lockable welded-in place vandal-proof tabs (one upper area, one lower area on door-latch side, rated at 2000 lbs. each). There shall be no exposed nut, bolts, screws rivets, or other fasteners on the exterior of the enclosure. Maximum cabinet dimensions 46"H x 20" W x 9" D. Weight 250 lbs. with batteries. UPS shall be mounted in an interior tilt out housing with 800 lb rated stops. Battery connectors shall be Anderson Connectors with silver plated contacts. Batteries shall be installed in fixed position framed trays for seismic safety and be readily accessible for maintenance. Batteries shall be mounted allowing airflow front and back. Enclosure shall include two transfer bypass switches, one for UPS bypass the second for auxiliary generator. All switches must be panel mounted on interior dead front panel board. UV resistant plastic laminated nameplates shall identify all controls and major components. A plastic covered wiring diagram will be attached to the inside of the front door. All components shall be factory wired and conform to required NEMA, NEC, and UL standards. A chassis ground point shall be provided. Panel shall be UL 508 Industrial Control Panel rated.

UPS Panel Minimum Features

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

UPS Minimum Specifications

UPS unit shall provide a true sine wave output with minimum 1400 volt-amp continuous capacity. UPS must provide for utility service isolation when in operation. The minimum rating for wattage output will be 950 watts. The UPS shall be capable of running an intersection with LED lights (for Run Time consult manufacturer). The unit shall operate off-line, with transfer time of 2 ms or less, with battery condition indicator, with automatic test provisions, and with hot-swappable batteries (all batteries in system). UPS will automatically recharge batteries from full discharge to 95% capacity within 6 hours. UPS will provide in-line operation for a minimum input of 92 to 145 VAC, provide full load output of 120 VAC – 10% / +4% at 60Hz +/- 0.05% over a temperature

range of -37 degrees celsius (optional adder) to +74 degrees celsius and be a UL approved design. The UPS unit will be delivered with maintenance manuals and schematic diagrams.

UPS Unit Minimum Features

- 1400 VA, 950 watts
- Surge energy withstand 480 joules, 6.5kA
- Common mode clamping 0 ns , 5ns typical UL 1449
- Conditioned power – computer quality
- Transient lighting protection – 160 joules
- Transfer to battery time – 2 ms
- Retransfer to utility – 2 ms
- Each battery shall be 24 volts @ 18 AH with heavy duty Anderson plugs and isolated fused (deadfront panel mounted 30 amp) connection to the UPS for greater system reliability and ease of maintenance. Series wiring is unacceptable.
- Fan cooling shall be fused for locked rotor current.
- Cooling air shall be ducted to cool the front and back of each battery with air space on all four sides of battery.
- UPS covers shall be 60% open on both sides to diminish the environmental effects of extreme temperatures.
- Includes a EIA-232, DB9 computer interface port.
- Low voltage safety design at 24v DC. (higher voltage DC systems are unacceptable).
- Generator Transfer Switch with UPS bypass and 30-amp external reverse service plug.
- UPS shall run a full LED intersection for a minimum of 4 hours.
- UPS shall be supplied with 7 batteries.
- UPS shall be supplied with an adjustable timer to force intersection to flashing red operation after determined battery operation period or upon low battery condition.

UPS Communications Module

Smart Slot Relay I/) Module:

Input #1	Turn the UPS on
Input #2	Turn the UPS off
Input #3	Start the UPS self-test
Input #4	Shut down the UPS (when on battery)

Output #1	The UPS is on-battery (during a power failure, self-test or run time calibration)
Output #2	UPS has a low battery – programmable
Output #3	the protected load is nit receiving power from the UPS
Output #4	Replace the UPS batteries

Batteries

Batteries shall be maintenance-free, type AGM/VRLA (Absorbed Glass Mat/Valve Regulated Lead Acid), such as APC Smart-UPS RMXL or approved equal. Batteries shall be independently pre-wired and individually fused. Batteries shall be furnished with heavy-duty 50 amp rated silver-plated Anderson connectors. 100 amp internal fuse by Battery supplier. Batteries shall be lightweight for personnel safety and protection plus ease of installation and maintenance. Batteries with a weight of over 26 lbs. are not acceptable.

Enclosure Temperature Compensation

Operating temperature shall be a minimum of -37 degrees celsius to +74 degrees celsius.

Power System Analyzer and Conflict Resolution Module

The UPS shall incorporate an integrated power system analyzer and conflict resolution module. The analyzer will evaluate and make limited adjustments to the incoming utility power and will automatically transfer load to the UPS battery back-up power if utility power is lost. When utility power becomes available, the system will provide automatic UPS failure detection and automatically isolate the failed UPS and transfer the load back to utility power. Once the failure has been corrected, the system will return the normal operation. This system shall include the following as a minimum:

- **Triple Bypass System for Off-Line UPS:**
 1. SPACT – Smart Power Analyzer with Conflict Monitor Isolation and Transfer Module
 2. PCM – Power Conflict Monitor
 3. The PCM is a totally redundant failsafe system. The PCM monitors load bus power available continuously. If load bus power fails for 5 ms the PCM will transfer and isolate the UPS and guarantee that commercial power will be locked on.,
 4. Watchdog timer – Redundant 5 ms delay and hard transfer to utility power.
 5. The outboard Smart Transfer Switch shall not interrupt the normal controller function. Transfer time shall be 2 ms.
 6. Onboard Smart I/O module will execute lockout of battery back up system upon Smart detection of any inverter UPS fault. If UPS resets itself, it will automatically be available for back up.
- Smart Battery Charger shall charge from shut off discharge to 95% fully charged in less than 6 hours. Batteries shall be ambient enclosure compensated to less the 120 degrees. The battery charger shall utilize Smart Cell technology to extend battery life.
- Smart boost and SmartTrim regulate under and over voltages without switching to battery.
- Battery replacement warning prevents downtime – the UPS shall automatically perform a self-test every two weeks. This ensures that the user will be alerted to degrading batteries before they wear out. Through software, or through the push of a button, self-tests shall be able to be performed at anytime.
- Faster recharge time – UPS battery charging system shall be microprocessor controlled to precisely charge batteries in less time than legacy UPS systems.
- Manufacturers shall provide a two (2) year factory-replacement of parts warranty on the Battery Backup System. Batteries shall be warranted for full replacement for two (2) years. The warranty shall be included in the total bid price of the Battery Backup System.

Contractor will install 2 #18AWG conductors from the On-Battery and Low Battery outputs of the UPS and connect to the Railroad1 input on the Input Panel of the traffic signal controller cabinet. This will force the traffic signal into flashing red operation upon loss of utility power and low battery condition.

1.22 CONTROLLER ASSEMBLY TESTING

The Contractor shall have the controller assembly tested by:

Team Econolite
3390 De La Cruz Boulevard, Unit R
Santa Clara, CA 95054
(408) 496-6280

Approximately 21 days will be required for testing.

The Contractor shall be responsible for the cost of controller assembly testing, delivery and pick-up.

1.23 EMERGENCY VEHICLE PREEMPTION EQUIPMENT

Contractor shall supply and install EMTRAC fire preemption equipment. All EMTRAC antenna enclosures shall be waterproof. The EMTRAC fire preemption receiver shall be installed in the traffic signal controller cabinet by the manufacturer's representative or authorized person prior to the start of the 21-day controller assembly testing.

1.24 LED (Light Emitting Diode) TRAFFIC SIGNAL MODULES

GENERAL DESCRIPTION

This specification covers LED pedestrian signal modules for 16" housings. It also covers red, green, and yellow LED modules to be used in place of the incandescent lamp, reflector, socket, gasket, and lens assembly of the vehicle signal sections. This technical performance specification is applicable to new construction projects and also the retrofit of existing signalized intersections.

Referenced vehicle type LED modules shall fit in all standard, incandescent vehicle traffic signal housings. Each module shall be complete and shall incorporate a red tinted lens for all red modules, a yellow tinted lens for all yellow modules, a green tinted lens for all green modules. *Screw-in* type products are not allowed for vehicle signals. Red, yellow and green signals shall utilize the *LumiLeds* (1) light engine/ robust hi-flux LED technology as their source of illumination. All indications shall fully comply with the latest versions of ITE VTCSH LED Circular Supplement, omnidirectional specifications of the ITE VTCSH LED Vehicle Arrow Traffic Signal Supplement, ITE PTCSI Part 2 LED Pedestrian Traffic Signal Module Specification. Manufacturers must be able to submit evidence of full compliance to all required testing methods, procedures, and sections as outlined in the ITE document Attachment 2, "Design Qualification Testing Flow Chart" without any changes, exceptions or omissions. Compliance testing reports must be from independent testing facilities such as ETL/Intertek. In addition, all yellow indications must comply with the corresponding specification across the temperature range of -40 degrees centigrade to +74 degrees centigrade without exceptions. All units shall be EPACT 2005 compliant

The housing of the LED signal module shall be marked 'TOP' to designate the proper orientation of the LED signal module in the traffic signal housing. Manufacturers part number, date code, and electrical characteristics of the LED signal module shall be visible on the rear of the assembly. The product shall be completely traceable by the serial number.

LED Ball, Arrow and Pedestrian Units shall conform to MIL-STD-810F, method 506.4, I for rain and for blowing rain and be provided with quick connect terminals and spade adapters.

LED pedestrian signals shall be furnished with a combination Portland Orange "Up-Raised Hand", and Lunar White "Walking Man" LED's. All pedestrian indication symbols shall be completely filled in, outlined indications shall not be allowed. LED Pedestrian indications shall also have a Portland Orange "Countdown Indication" showing the remaining Walk/Don't Walk time. Unit shall have uniform appearance symbols that exceed latest ITE PTCSI Part 2 requirements.

The Countdown Pedestrian Signal shall be user configurable through dipswitches allowing the user to deactivate the countdown operation or activate countdown of Walk+Don't Walk time, countdown of Walk time and then Don't Walk time and countdown of Don't Walk time only.

Countdown display shall feature 2-row 9" high countdown digits that are MUTCD compliant for crosswalks over 100 feet. Countdown shall be fully preemption compatible, and revert to its previous timing immediately following a preemption call. Display shall have memory feature to allow countdown timing to be stored internally, even when power is off for extended time. Unit shall automatically adjust to traffic signal controller pedestrian interval changes. Unit shall be sealed for moisture resistance, lens shall be textured to reduce glare, and quick connect terminals and spade adapters shall be provided. Units shall be ENERGY STAR qualified.

All supplied LED signals shall have a manufactured date of no more than 6 months prior to installation date.

All LED signals shall be manufactured by Dialight or approved equal.

ELECTRICAL

All LED signal and pedestrian modules shall operate over the temperature range of -40°C (-40°F) to +74°C (+165°F). Power factor shall be 90% or greater, at nominal rated voltage, at 25°C, after 60 minutes of operation. Total harmonic distortion (THD) shall be less than 20% at rated voltage, at 25°C.

Maximum turn on/turn off time shall be 75msec.

All LED traffic signal modules shall be in compliance with FCC Title 47, Subpart B, Section 15 Regulations for electrical noise.

The LED signal modules shall be connected directly to line voltage, **120 Volts AC nominal**, and shall be able to operate over the voltage range of 80 VAC to 135 VAC.

The 8" and 12" red LED ball units shall consume no more than 8 watts, at 120 VAC, at 25°C. The minimum luminous intensity shall be 165cd and 365cd for the 8" and 12" red LED ball units when measured at the initial peak intensity point. The dominant wavelength shall be 625nm. Both units shall be approved by Caltrans and meet latest ITE VTCSH-2.

The 8" and 12" yellow LED ball units shall consume no more than 9 and 12 watts respectively, at 120VAC at 25°C. The minimum luminous intensity shall be 410cd and 910cd for the 8" and 12" yellow LED ball units when measured at the initial peak intensity point. The dominant wavelength shall be 590nm. Both units shall be approved by Caltrans and meet latest ITE VTCSH-2.

The 8" and 12" green LED ball units shall consume no more than 8 and 9 watts respectively, at 120VAC at 25°C. The minimum luminous intensity shall be 215cd and 475cd for the 8" and 12" green LED ball units when measured at the initial peak intensity point. The dominant wavelength shall be 500nm. Both units shall be approved by Caltrans and meet ITE VTCSH-2.

The 3-row LED Arrow units shall consume no more than 6 watts for Red, 9 watts for Yellow, and 6 watts for Green at 120VAC at 25°C. The dominant wavelength shall be 628nm for the Red, 590nm for the Yellow and 500nm for the Green. All units shall be approved by Caltrans and meet ITE VTCSH-2.

The LED Pedestrian signal shall consume no more than 5 watts for countdown display, 8 watts for hand display, and 6 watts for person display at 120VAC at 25°C. The minimum luminance shall be 1400cd/m² for countdown and hand display and 2200cd/m² for person display. Unit shall conform to MIL-STD-810F, method 506.4, I for rain and for blowing rain, MIL-STD-883, Test Method 2007 for mechanical vibration, MIL-STD-883, Test Method 1010 for temperature cycling requirements. The Luminance uniformity and color uniformity shall exceed ITE PTCSI-2 LED Pedestrian Signal Specification requirements. Transient suppression shall exceed latest ITE PTCSI-2 LED Pedestrian Signal Specification and meet the following standards: NEMA TS-2 Sec 2.1.6 and 2.1.8, IEC 1000-4-5, 3KV, 2ohn source impedance, and ANSSI/IEEE C62, 41-2002; IEC 61000-4-12, 6KV, 200A, 100KHz ring wave.

(1) *LumiLeds is a trademark of LumiLeds Corporation.*

SPARE EQUIPMENT

The contractor shall supply one spare LED of each color (Red, Yellow, Green, Portland Orange, Lunar White), for each type (12" Ball, 12" Arrow, 8" Ball, Pedestrian Indication) supplied for this project.

1.25 WIRELESS COMMUNICATION EQUIPMENT

The wireless communication equipment shall use spread spectrum radio technology to allow communication between controllers with equal or superior function to signal interconnect cable. The wireless communication equipment shall include radio modems, directional antenna, cabling, and software required to transmit communication between controller assemblies. The Contractor shall have a authorized manufacturer's representative present on the day of the traffic signal turn-on to program and fine-tune the wireless communication equipment.

- a. Spread Spectrum Radio Interconnect Equipment-The Contractor shall install spread spectrum radio-based interconnect equipment. The spread spectrum radio communications equipment shall be based upon a point-to-multi-point spread spectrum technology.

The purpose of the communications equipment is to provide a data link between the central traffic signal control system and the local signal controllers.

The radio shall be certified for use with the Bitrans Quicnet Traffic Signal Control Program Version 4.0. Written documentation of this certification shall be provided to the Engineer for approval.

The radios shall operate with the Model 170E controller-based traffic signal control and shall be transparent to the system (i.e., fully capable of operating with the communications protocol required by the traffic signal control system). These features of the installed system shall be well documented.

The radios shall meet FCC Part 15.247 requirements for unlicensed use, and operate with a communications protocol that is transparent to the central traffic signal control system (i.e., the radios shall be compatible with the central traffic signal control system communications protocol and with the configurations of the central traffic signal control system). The radios shall be able to function as either a master, repeater or remote, and use direct sequence techniques to spread the radio frequency (RF) carrier. The radios shall be encased in a hardened unit and meet the National Electrical Manufacturer's Association (NEMA) TS-1 environmental standards for traffic signal equipment. Other features to be provided by the radio are the following:

- 1) operate in the 2.4000 to 2.4835 GHz radio frequency range
- 2) provide for installation in the controller cabinet
- 3) offer at least nine user-selectable channels, with at least five non-overlapping channels
- 4) allow connection to either an omni-directional or directional antenna
- 5) offer point-to-point, point-to-multi-point and repeater capability
- 6) user-selectable power output (one watt, maximum as outlined by the FCC)
- 7) provide RS-232 interface
- 8) operate with 110 VAC

- b. Radios, Antennas, Cabling and Connections--The Contractor shall install the remote radios inside the controller cabinets of the project signals as designated in the plans and as described in these specifications. The only portion of the radio that shall be installed outside the controller cabinet shall be the radio antenna. The antenna for the remote radios shall be installed by the Contractor at a location on a signal pole or street light pole at the intersection as determined in cooperation with the Engineer. All cabling and connections from the remote radios to the local controller and the antenna shall be installed by the Contractor in cooperation with the Engineer.

The Contractor shall use the facilities within the radio as well as external test equipment to maximize the signal strength through antenna placement and aim. This shall also include testing the 2.4000 to 2.4835 GHz radio spectrum for signals that may interfere with the operation of the radios to be installed. The Contractor shall make adjustments to the radio to minimize the impact of any potential interference.

The Contractor shall provide the Engineer with written documentation of this testing. This documentation shall include printouts from the testing equipment. The Contractor shall also provide written documentation of all switch or jumper settings for each radio installed.

The Contractor shall install the 120-volt power connection such that it will not become disconnected by vibration of thermal stresses in the controller cabinet. The Contractor shall work with the signal maintenance staff to accommodate this requirement.

- c. Antennas-Antennas shall be directional antennas compatible with the spread spectrum radio system.

Directional antennas shall be Yagi antennas, having a minimum of 16 dBi gain, connected with coaxial cable to the radios. The directional antennae shall be as recommended by the radio manufacturer. The directional antennas shall be installed at the local intersections.

All antenna mounting equipment shall be stainless steel or galvanized, and shall be furnished by the Contractor. The connections between the antenna and the coaxial cable feed shall be sealed to prevent moisture intrusion into the connection.

- d. Cabling and Connections-Cabling and connections shall be materials intended for use with the radios and antennas.

The cable connecting the radios to the antenna shall be as follows or as recommended by the radio manufacturer. The cable between the directional antennae and radios shall be Times Microwave LMR400. The cables shall be suitable for installation in underground locations susceptible to moisture.

All exterior connections shall be taped and sealed to prevent moisture intrusion as directed by the traffic engineer.

- e. Spare Equipment-The contractor shall provide one spare spread spectrum radio, up/down converter, directional YAGI antenna, cables to connect up/down converter to lightning suppressor, cable to connect radio to traffic signal controller and lightning suppressor, and lightning suppressors for the cabinet and antenna.

1.25 LED SAFETY LIGHTING

General Specifications

It is the intent of the attached minimum specifications to describe the said equipment, apparatus and supplies or materials to be purchased for the City of Sunnyvale. All items described within the specifications must be new, unused, and of the manufacturer's latest design and model unless otherwise specified. All Standard Equipment must be provided. All necessary parts not mentioned, but needed for operation of the items specified must be supplied.

General Description

Slim, low profile design, that minimizes wind load requirements. Fixture is constructed from rugged extruded aluminum and cast aluminum components. LED drivers are mounted in the cast aluminum housing which is suitable for wet listed operation (per UL 1508 requirements). A High Performance aluminum heat-sink is specifically designed for LED 'Area Light' applications. Finish includes an E-coat epoxy primer with an ultra-durable powder topcoat providing excellent resistance to corrosion and ultraviolet degradation and abrasion.

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1. **Luminaire Efficiency** – allow for thermal and optical losses- efficiency should be determined on a delivered lumens per watt basis for comparison at each luminaire drive current required
 - Initial delivered lumens per watt minimums required with independent testing lab verification:
 - 60 Lumens per watt (L/W) at 350mA drive current
 - 50 Lumens per watt (L/W) at 525mA drive current
 - 45 Lumens per watt (L/W) at 700mA drive current
2. **Depreciation**
 - Average Delivered Lumens – Average delivered lumens over 50,000 hours of operation should be a minimum of 95% of initial delivered lumens.
 - LED's in the luminaire shall be rated for "life" in hours as defined by IESNA standards.
 - Average delivered lumens for 350 mA drive current shall be 70% of initial delivered lumens after > 150,000 hours of operation at 15 C ambient
 - Average delivered lumens for 525 mA drive current shall be 70% of initial delivered lumens after 117,000 hours of operation at 15 C ambient (does not apply to 40, 50 and 60 LED product)
 - Average delivered lumens for 700 mA drive current shall be 70% of initial delivered lumens after 65,000 hours of operation at 15 C ambient (does not apply to 50 and 60 LED product)
3. **Light Distribution** – Specify light Distribution required and IESNA luminaire
 - Classification (LCS). Fixture should have FVH and BVH values of equal to or less than 0.5%, and UP of 0%. The LCS values are intended to replace previous "Full Cutoff" designation which is no longer printed on test reports per IES TM-15-07 standard. Luminaire should have independent photometric test reports and be Dark sky compliant.
4. **Maximum System wattage (including driver loss) –**
 - LED wattage only not accepted.
 - **Provide calculation of delivered lumens/total wattage with bid.**
 - If LED lumens/watt increase between the time of specification and the time
 - Product of ordering you will either get more light for the same energy or be
 - Able to reduce the wattage to obtain the same delivered lumens.
5. **Color Temperature and CRI** – 6000K +/- 500 color temp, 75 CRI.
6. **Warranty** – 5years on the LEDs, 5 years on the driver,
 - 10 years on the paint finish of the fixture. (Pole warranty listed separately)
7. **Electrical Safety** – wet listed in the US and Canada, UL, ROHS
 - and EMI, Class 1 rated luminaire
8. **Driver Specifications**
 - A. Electronic
 - B. Voltage range (120 – 277V) +/- 10%, (347-480V) +/-10% optional

- C. Current .350 Adc (+/- 5%), .525 Adc (+/-5%), .700 Adc (+/-5%)
- D. Frequency 50/60 Hz
- E. Power Factor >90% at full load
- F. THD < 20% at full load
- G. Load Regulation: +/- 1% from no load to full load
- H. Output ripple < 10%
- I. Output should be isolated
- J. Case temperature: rated for -40 through +80 C
- K. Fully encased and potted
- L. Overheat protection, self-limited short circuit protection
 - And overload protected
- M. Primary Fused
- N. Life rating not less than 100,000 hours

9. **Mechanical / Other**

- A. Tool-less entry
- B. Utilizes terminal block for power input suitable for #6 AWG wire
- C. Designed to mount on 1.25" IP and / or 2" IP horizontal tenon and is adjustable +/-5 degrees to allow for fixture leveling
- D. Bubble leveling

10. **Factory installed options**

- A. Button Photocell
- B. IP66 Rating
- C. Fuse
- D. NEMA photo control receptacle
- E. Backlight Cut-Off

11. **Provide the Following information with the bid Proposal:**

- A. Literature
- B. Detailed Manufacturer's Specifications
- C. Test Reports

LED safety lighting fixture shall be BetaLED BLD-STR-T3-HT-068-LED-B-UL-SV-R LEDway Street Light-Type III, or approved equivalent.

1.26 NUMBERING SAFETY LIGHTS AND STREETLIGHTS

The placement of numbers on street light poles and safety light (traffic signal) poles will be done by the contractor. Alpha-numeric pole designation shall be provided by Transportation and Traffic staff, contractor shall provide aluminum signs, white sheeting with black numbers per plans or as directed by the city transportation engineer. Secure signs to the pole using rust proof screws as directed by the city Transportation Engineer. A paper plot of the sign must be submitted to the City Transportation Engineer for approval before fabricating signs.

1.27 TRAFFIC SIGNAL FUNCTIONAL TEST – PRE TURN-ON

A functional test for each new system shall consist of not less than seven (7) days of continuous, satisfactory operation (pre turn-on). During the functional testing period all vehicular and

pedestrian indications shall remain dark until satisfactory operation is obtained. If unsatisfactory performance of the new system develops, the condition shall be corrected and the test shall be repeated until the seven (7) days of continuous, satisfactory operation is obtained.

The following steps should be followed for a typical traffic signal pre turn-on:

- a. Service cabinet shall have been inspected by Building Inspection and must be energized and fully functioning.
- b. Contractor shall have all field and cabinet wiring, signal equipment, EMTRAC, communications equipment, video detection, controller cabinet components and controller cabinet installed and functioning. All striping and pavement markings must have been completed as well.
- c. Contractor shall requests a pre-turn on inspection through the Public Work Inspector once all items on "b" have been completed and once the City authorized Traffic Signal Technician has inspected and approved the installation, this inspection will also include the cabinet wiring, auxiliary equipment and TESCO electric service/UPS cabinet wiring and operation. The Traffic Signal Technician will only inspect the signal for completeness. The Contractor shall complete items as necessary and reschedule another pre turn-on inspection if a deficiency if found. A one week notice is required to schedule this inspection. The pre turn-on inspection is not a final inspection.
- d. Contractor performs a flashing pre turn-on operation after the City authorized Traffic Signal Technician finds the traffic signal satisfactory. Contractor will flash the signal while the City authorized Traffic Signal Technician verifies the operation and in the presence of the Public Works Inspector.
- e. The contractor shall schedule the cabinet manufacturer's representatives and all necessary authorized traffic signal equipment technicians for the pre turn-on work as outlined in Section 1.19 of these specifications. The contractor shall be responsible for the any and all cost associated with their work.
- f. If the flashing pre turn-on is successful the seven (7) day of continuous operation "run dark" can start.
- g. Signal pre turn-on shall be performed on Tuesdays, Wednesdays, or Thursdays only. Pre Turn-On shall start at 9:30 a.m. and shall be completed by 2:30 p.m.

1.28 TRAFFIC SIGNAL TURN-ON AND ACCEPTANCE

Acceptance of new traffic signals shall be made only after all traffic signal circuits have been thoroughly tested and the seven (7) days functional test is satisfactory.

After the seven (7) days of continuous satisfactory operations the contractor shall schedule a final turn-on day through the Public Works Inspector. A one week notification is required to schedule the turn-on. The contractor shall coordinate with Sunnyvale Public Safety to have officers present during the signal turn-on at the contractor's expense.

The day of the final turn-on at the approval of the City Transportation Engineer and with officers from the Sunnyvale Public Safety present, the Public Works Inspector will direct the Contractor to place stop signs at all approaches, once this is done, the Contractor will proceed to de-energize the old traffic signal. The Contractor shall then proceed to remove the old traffic signal equipment,

poles, signs, etc. After the new traffic signal heads are free of any obstructions from the old traffic signal the Public Works inspector will direct the Contractor to remove all the stop signs so 4-way red flashing operations on the new traffic signal can be initiated.

A walk through will be performed by the Contractor, City authorized Traffic Signal Technician, City Transportation Engineer and Public Works inspector prior to the final turn-on. During this walk through a check of all the signal and pedestrian heads proper alignment will be done. Contractor shall correct deficiencies as required.

The City Transportation Engineer and City authorized Traffic Signal Technician will verify traffic signal controller programming and operation including timing parameters against timing sheet as well as all the major components associated with the traffic signal operation.

After the traffic signal operation has been verified by the City Transportation Engineer and City authorized Traffic Signal Technician the Public Works inspector will instruct the Public Safety Officer to stop traffic in all directions so the new traffic signal can be placed in normal operations.

Once the new traffic signal system is successfully activated permanently the Contractor shall schedule a final inspection. The City Transportation Engineer, City authorized Traffic Signal Technician, and Public Works inspector will prepare a deficiency list. This deficiency list will then be delivered to the contractor by the Public works Inspector. All deficiency list item must be corrected by the contractor prior to final acceptance. A one week notification is required to schedule a final inspection.

Traffic Signal turn-on shall be performed on Tuesdays, Wednesdays, or Thursdays only. Turn on shall start at 9:30 a.m. and be completed by 2:30 p.m.

1.29 REMOVING AND SALVAGING ELECTRICAL EQUIPMENT

All salvaged electrical materials shall be hauled to the City of Sunnyvale, Traffic Engineering Storage Facility at 1010 Morse Avenue, Unit 15, Sunnyvale, CA 94089 and stockpiled.

The Contractor shall provide equipment, as necessary, to safely unload and stockpile the material. All salvaged controller cabinets and electrical equipment shall be securely fastened or bolted to wooden pallets. A minimum of two working days notice shall be given prior to delivery.

2. SIGNING, STRIPING & MARKINGS:

2.1 REMOVE TRAFFIC STRIPES AND PAVEMENT MARKINGS

Where blast cleaning is used for the removal of thermoplastic traffic stripes and pavement markings or for removal of objectionable material, and such removal operation is being performed within 10 feet of a lane occupied by public traffic, the residue including dust shall be removed immediately after contact between the sand and the surface being treated. Such removal shall be by a vacuum attachment operating concurrently with the blast cleaning operation.

2.2 REMOVE ROADSIDE SIGNS

Existing roadside signs and/or sign posts, at locations shown on the plans to be removed, shall be removed and salvaged to the City's Corporation Yard at 221 Commercial Avenue, Sunnyvale.

Existing roadside signs shall not be removed until replacement signs have been installed or until the existing signs are no longer required for the direction of public traffic, unless otherwise directed by the Engineer.

2.3 RELOCATE ROADSIDE SIGNS

Existing roadside signs shall be removed and relocated at new locations shown on the plans.

Each roadside sign shall be installed at the new location on the same day the sign is removed from its original location.

2.4 INSTALL ROADSIDE SIGNS

Roadside signs shall be installed at the locations shown on the plans or where directed by the Engineer, and shall conform to the provisions in Section 56-2.01A through 56-2.01C, "Signs," of the State Standard Specifications.

2.5 THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS

All new striping (including lane lines) and legends shall be thermoplastic.

The State Specification No. for glass beads in Section 84-1.02, "Materials," of the Standard Specifications is amended to read "8010-21C-22 (Type II)."

2.6 RESTORATION OF CURB MARKINGS

Contractor shall reference out and restore any curb markings (S-indicating sanitary sewer lateral; W-indicating water service lateral; arrows and Roman Numerals-indicating ties to water main valves; high-pressure gas main) that may be destroyed by its work. In the case of construction of curb ramps where the vertical curb is eliminated new ties to water valves shall be made on the closest available vertical curb with proper direction of arrows and proper distances from water valve to tie indicated in three-inch (3") high Roman Numerals.

2.7 RESTORATION OF PAVEMENT STRIPING AND MARKINGS

The Contractor shall repaint any pavement striping or markings that are damaged by trenching or other operations during the course of the project. The entire stripe element (individual stripe) or

marking (cross walk lines, turn arrows, etc.) shall be repainted—"touch ups" will only be allowed if approved by the Engineer.

Unless approved otherwise by the Traffic Engineer, all repainted pavement markings shall be thermoplastic as described in Section 2.5 above.

3. CONCRETE WORK:

3.1 SIDEWALKS, CURB AND GUTTER, AND TRAFFIC SIGNAL POLE FOUNDATIONS

Portland Cement Concrete used for sidewalks, curb and gutter and traffic signal pole foundations shall meet the specifications for concrete class, minimum compressive strength, cement weight, combined aggregate gradation and maximum slump as indicated in the latest CALTRANS Standard Specifications.

Sidewalk and curb and gutter concrete mixtures shall include 1 pint of Lamp Black color admixture per 1 cubic yard of concrete.

4.0 TRAFFIC CONTROL

4.1 MAINTAINING TRAFFIC/TRAFFIC CONTROL

Attention is directed to Sections 7-1.03, "Public Convenience," 7-1.04, "Public Safety," and Section 12, "Temporary Traffic Control," of the State Standard Specifications and these Technical Provisions. Nothing in these Technical Provisions shall be construed as relieving the Contractor from the responsibilities specified in Section 7-1.04.

Lane closures shall conform to the provisions in the section of these Technical Provisions entitled "Traffic Control System for Lane Closure." Arrow boards shall be used for all lane closures. The Contractor shall check with City Traffic Engineering to confirm any lane closure restrictions that may be in effect before closing any lanes.

The provisions of Section 7-1.03 of the State Standard Specifications regarding State-furnished signs are hereby revised to provide that all signs and other warning devices shall be provided by the Contractor and shall become his property after the completion of the contract. Section 12-1.03 is revised to provide that all flaggers and guards shall be furnished by the Contractor at its expense. The Contractor shall furnish, erect, maintain, and remove all necessary signs and devices during the length of this contract.

The Contractor shall provide a traffic control plan for each street included in the contract per City of Sunnyvale Temporary Traffic Control (TTC) Guidelines, and latest CA-MUTCD Part 6. Contractor shall include the Temporary Traffic Control Checklist at the time of submittal of plan. The traffic control plans shall be specific for each street and for each phase of the project on each street. The traffic control plans must be reviewed and approved by the City of Sunnyvale Transportation Engineer prior to starting work. The traffic control plans shall be submitted for all streets in the project as one package for review by the City. Partial submittals will be rejected by the City. The traffic control as designed by the Contractor and identified on the traffic control plan shall be in place prior to the start of each day's work. At the pre-construction meeting, the traffic control requirements for the project shall be reviewed with the Contractor, and at the meeting, all of the Contractor's foremen or supervisors shall be present.

The Contractor will post "No Parking" signs, as necessary, not less than 72 hours in advance of scheduled work that will restrict parking. If the work is not performed during the timeframe indicated on the "No Parking" signs, the work will be rescheduled with at least five (5) working days advance notice. The Contractor shall leave the streets open to traffic until just prior to starting the work, and will provide all barricades, signs and traffic control necessary to protect the work. The Contractor will perform all re-posting of "No Parking" signs and re-notification occasioned by his failure to meet the posted schedule.

Any delays caused by failure of the Contractor to adhere to the approved schedule will be at the Contractor's sole expense. No additional compensation will be allowed for costs resulting from said delays.

Except for temporary interruptions approved by the Engineer, property owners shall be provided access to their property over both walkways and driveways at all times. The Contractor shall construct work to allow such access.

The Contractor shall maintain a safe workplace throughout the job including, but not limited to, providing flaggers, safety equipment, barricades, safe pedestrian passage along sidewalks, and maintenance of handicap access throughout the project site where applicable.

The Contractor shall fulfill the requirements of this section 24 hours per day, seven days per week, including holidays, from the time the Notice to Proceed is issued until the project is accepted as complete.

Whenever vehicles or equipment are parked on the shoulder within 6 feet of a traffic lane, the shoulder area shall be closed with fluorescent traffic cones or portable delineators placed on a taper in advance of the parked vehicles or equipment and along the edge of the pavement at 25-foot intervals to a point not less than 25 feet past the last vehicle or piece of equipment. A minimum of 9 cones or portable delineators shall be used for the taper. A C23 (Road Work Ahead) or C24 (Shoulder Work Ahead) sign shall be mounted on a portable sign stand with flags. The sign shall be placed where directed by the Engineer.

Bicycle lanes shall be maintained by the Contractor at all times during construction. Appropriate warning signs designed for bicyclists shall be used by the Contractor, as necessary, so bicyclists can safely traverse the construction zone.

When entering or leaving roadways carrying public traffic, the Contractor's equipment, whether empty or loaded, shall in all cases yield to public traffic.

The provisions in this section may be modified or altered if, in the opinion of the Engineer, public safety and convenience will be better served and work expedited. Said modifications or alterations shall not be adopted until approved in writing by the Engineer.

The Contractor shall not direct any traffic while a traffic signal is in operation. The Contractor shall make arrangements 5 days in advance with the City Public Safety Department (408-730-7109) to have City police direct traffic for traffic control at the Contractor's expense.

The Contractor shall coordinate closely with the City of Sunnyvale during the turnover of the existing traffic signal to the new traffic signal installation. The removal of existing traffic signal heads over existing travel lanes shall be performed after the new traffic signal heads for the same travel lanes have been tested and approved by the City. Once the new signal heads are approved for operation by the City, the Contractor shall conduct traffic control in accordance with the requirements specified herein these special provisions.

4.2 TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE

A traffic control system shall consist of closing traffic lanes and ramps in accordance with the details shown on State Standard Plans T-11, T-12 and T-14, the provisions of Section 12, "Temporary Traffic Control," of the State Standard Specifications, the provisions under "Maintaining Traffic/Traffic Control" elsewhere in these Technical Provisions and these Technical Provisions.

The provisions in this section will not relieve the Contractor from the responsibility to provide additional devices or take measures as may be necessary to comply with the provisions in Section 7-1.04, "Public Safety," of the State Standard Specifications.

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

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

When lane closures are made for work periods only, at the end of each work period, all components of the traffic control system, except portable delineators placed along open trenches or excavations adjacent to the traveled way, shall be removed from the traveled way and shoulder. If the Contractor so elects, the components may be stored at selected central locations, approved by the Engineer.

ATTACHMENT J



City of Sunnyvale
Department of Public Works
Division of Transportation and Traffic

Signal Interconnect Cable Test Report

Project Name: _____

Project Number: _____ Date: _____

Field Tester Model: _____

Pair No.	Insulation Resistance (T-R-Tip to Ring) ≥ 5 Megohms	Continuity (T-R-Tip to Ring) ≤ 5 ohms	Distance ft
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Request for Proposal #F15-83

Traffic Signal Preventative Maintenance and Repair Services

City of Sunnyvale, California
(Original)

Submitted By:

aegis
ITS

April 29, 2015





An Econolite Group Company

April 29, 2015

Attn: Des Gebre
Buyer
City of Sunnyvale
Purchasing Division
City Hall Annex
650 West Olive Avenue
P.O. Box 3707
Sunnyvale, CA 94088-3707
Phone: (408) 730-7612

Subject: Request for Proposal #F15-83, Traffic Signal Preventative Maintenance and Repair Services

Dear Mr. Gebre,

Aegis ITS, Inc. (Aegis) is pleased to submit this proposal to the City of Sunnyvale for the Traffic Signal Preventative Maintenance and Repair contract. As a leading Intelligent Transportation System (ITS) maintenance firm, we provide traffic signal system and maintenance services, systems engineering, software development, and ITS installation, integration, and maintenance. Aegis is uniquely qualified to support the City's traffic signal system maintenance services needed for the City's 130 traffic signals, 10 In-Road Warning Light (IRWL), and four flashing beacon systems with the following attributes:

- A class C-10 as well as C-7 contractor's license issued by the California State Contractor License Board (CSLB). We have consistently held a valid C-10 contractor's license for over 11 years in good standing.
- The highest caliber technicians capable of performing their duties under the most exacting of circumstances. Many of our technicians hold Level II and III International Municipal Signal Association (IMSA) certifications, and are National Electrical Code (NEC) licensed certified.
- Professionalism, quality, and reliability. Aegis has never failed to complete a contract in our 13-year history.

Thank you for your time and consideration. Aegis looks forward to the opportunity to continue serving the City of Sunnyvale on the Traffic Signal Preventative Maintenance and Repair Services contract. If additional information is required, please do not hesitate to contact John Cane at (408) 201-4404 or Rodney Mathis at (714) 397-7608.

Sincerely,

Aegis ITS, Inc.

A handwritten signature in black ink, appearing to read "Rodney Mathis".

Rodney Mathis
Executive Vice President

3360 East La Palma Avenue
Anaheim, CA 92806-2856
Office: 714-238-9277
Fax: 714-630-1973
www.aegisis.com

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SECTION VII. PROPOSAL CHECKLIST

This checklist has been provided to assist Proposer in complying with RFP requirements. All items listed must be included with the proposal. To assist in proposal evaluation, Proposer shall cross-reference the required item with the applicable page in the proposal.

Proposer shall check off each item as it is assembled into the proposal, enter the page number where the item can be found in the proposal, detach the checklist from the RFP and submit it as part of the proposal.

Item	Format	Proposal Page No.
_____ Original +4 copies of proposal	As specified in RFP	_____
_____ Proposer checklist	Section VII	_____
_____ Proposer additional information	Section VI	_____
_____ Signature page/ Proposal Form	Section VI	_____
_____ Approach, method, and qualification	Narrative	_____
_____ Proposal Form	Section VI	_____
_____ List of key personnel and qualifications	Narrative	_____
_____ Description of shop and storage facilities	Narrative	_____
_____ List of communication equipment to be used	Narrative	_____
_____ Inventory of equipment	Narrative	_____
_____ List of special equipment	Narrative	_____
_____ List of repair, utility and maintenance vehicles	Narrative	_____
_____ Training and safety programs	Narrative	_____
_____ Traffic Signal maintenance and inventory management system for the City	Narrative	_____
_____ Ongoing maintenance and support	Narrative	_____
_____ List of relevant employees and office location	Narrative	_____
_____ Addenda acknowledgment receipt	Section VI	_____
_____ Service Agreement acceptance	Narrative	_____

Company Profile

Aegis ITS, Inc. (Aegis) originally operating as Econolite Traffic Engineering and Maintenance, was incorporated in 2002 in Anaheim, California. Aegis was created to expand upon our parent company Econolite Group, Inc. (EGI) services and capabilities. Originally started to solely provide traffic signal and streetlight installation, repair, and maintenance services, Aegis expanded in 2009 to complement the Econolite brand with additional services to the Intelligent Transportation Management (ITS) market.

Aegis is a wholly owned subsidiary of EGI, and for over 80 years has been primarily serving the transportation industry. With over 750 employees throughout North America, Asia and the Middle East, EGI serves as the parent company to six subsidiaries representing a full spectrum of traffic management services and has a long-standing reputation for quality and innovation in traffic control products.



Providing traffic signal, communications, and ITS maintenance services, Aegis combines EGI's industry-leading products with professional engineering staffing and technical services tailored to each client's needs. We currently maintain over 5,000 Traffic Signals and ITS devices, plus over 10,000 streetlights, with a staff of over 40 electricians and signal technicians.

A. Qualifications of Key Personnel

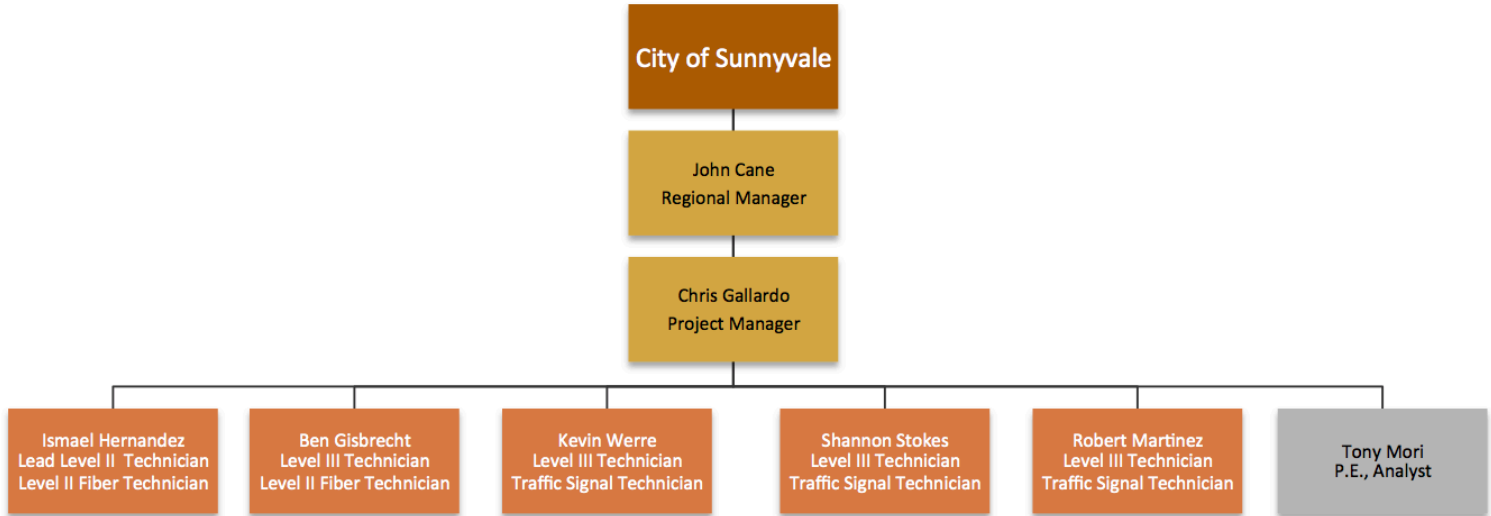
Aegis has the resources and expertise to comprehensively address the City of Sunnyvale's requirements for the Traffic Signal Preventative Maintenance and Repair Services contract. We have been providing the City with its 130 traffic signal maintenance for the last ten years since July 2005. Our proposed technicians are the current technicians for the City and therefore are familiar with all traffic signal controllers in operation. They are also familiar with all current equipment and the City's programming standards for both isolated traffic signals and controller timing coordination.

Names, Titles, and Qualifications of Key Personnel

Our designated personnel are International Municipal Signal Association (IMSA) Level II and Level III technicians and National Electrical Code (NEC) certified electricians with many years of experience in the traffic maintenance industry. In addition, Aegis's organizational staff has two IMSA certified Fiber Optics ITS Level II Technician that are available for fiber troubleshooting, repairs, and splicing on a 24 hours, 7 days per week basis, including holidays.

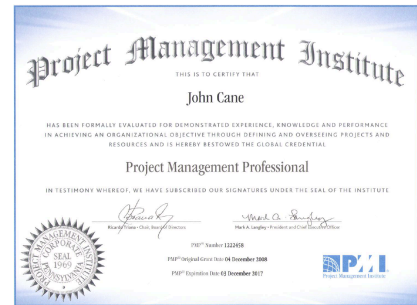
Organizational Chart

Provided below is Aegis organizational chart and a brief introduction of our proposed local key staff assigned to the City.



John Cane, Regional Manager, PMP

Regional Project Manager, John Cane will provide the overall project management for the City of Sunnyvale's Traffic Signal Preventative Maintenance and Repair Services contract. He has over 26 years of experience. His experience includes underground utility maintenance, traffic signal and lighting maintenance and repair, communications, project management, preventative maintenance, and extraordinary maintenance. John has a Bachelor of Science degree in Business Administration and is a PMP Certified Project Manager. He also holds International Municipal Signal Association (IMSA) work zone safety certification and IMSA Level II traffic signal field certification. John has recently completed Level I Technician certification for fiber optics for traffic, fire alarm, and communication systems.



Chris Gallardo, Project Manager



Chris Gallardo will serve as the Project Manager for this contract, as well as the additional point-of-contact and will assist John Cane. He graduated and holds a Bachelor of Science degree in business administration, having studied electrical engineering for two years in college. Prior to his employment, he worked out in the field as a technician's assistant, which gave him valuable field experience. Chris is also IMSA Level I Fiber certified.

Ismael “Smiley” Hernandez, Lead Traffic Signal Electrical Technician

Ismael “Smiley” Hernandez will be the lead technician for the City of Sunnyvale contract. Smiley will ensure PM’s and projects are completed on time and will be the main technical contact for the city. He has 21 years of experience in the signal maintenance industry as a utility technician. He has extensive training in maintenance and repair of traffic control devices that includes CCTV repair and maintenance, street lighting, signal installation, video detection, cabinet installation, and battery backups. Smiley is an IMSA certified traffic signal inspector, level II technician, level II fiber technician and an NEC certified electrician.

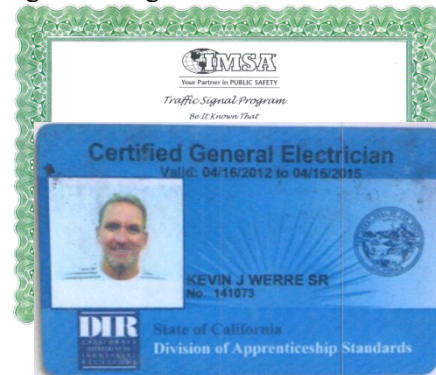


Ben Giesbrecht, Traffic Signal Technician

Ben Giesbrecht will perform PM’s and projects for the City. Ben will respond to emergency calls and fiber cuts/repairs. He has over eight years of experience in the traffic signal maintenance industry. He is an IMSA Level III Traffic Signal Field Technician, and a certified National Electrical Code (NEC) electrician. Ben is also an IMSA Level II certified fiber technician and has experience in fiber restoration and repair. Ben also has extensive knowledge in all types of traffic signal controllers, including NEMA 170, and 2070. His troubleshooting skills include radar and video detection, conductor and cabinet component failures and signal timing issues.

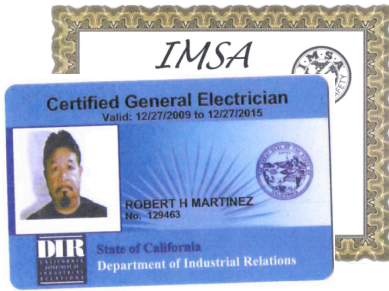
Kevin Werre, Electrical Technician

Kevin Werre will be responsible for utility work and emergency calls. He has over 21 years of experience. His extensive experience includes: CCTV installation and configuration, operations, fiber optics, Ethernet over copper cabling equipment installation and configuration, troubleshooting, installation, modifications, and repairs of NEMA TS-1, TS-2, and 332 cabinets, controllers, and other various components, implementation, testing, and fine tuning of hardware, software, signal timing for transit priority systems, and evaluation and adjustment of signal timing and coordination plans. Kevin is an IMSA Level II Traffic Signal Field Technician and a certified NEC electrician.



Shannon Stokes, Traffic Signal and Lighting Technician

Shannon Stokes will run daily and after hours call outs. He has six years of experience as a traffic signal and lighting technician. He is an IMSA Level II technician. Most recently, he has worked in the City of Fremont and has been the lead technician for the Alameda County Transportation Commission Smart Corridor. Shannon’s experience includes CCTV, 332 cabinets, cabinet and controller testing.



Robert Martinez, Traffic Signal Technician

Robert Martinez will perform PM's and mark outs. Robert will also respond to emergency calls. He has over eight years of experience in the traffic signal maintenance industry. He is an IMSA Level III Traffic Signal Field Technician, and a certified National Electrical Code (NEC) electrician. Robert has extensive knowledge in all types of traffic signal controllers, including NEMA 170, and 2070.

Tony Mori, P.E., Analyst

Aegis will partner with Tony Mori, a California licensed in-house Professional Traffic and Civil Engineer, to provide the City of Sunnyvale with traffic signal analyst services.

Tony specializes in all traffic engineering and transportation planning. He has prepared traffic signal improvement plans for over 150 intersections throughout Northern California over the past 15 years. Tony is experienced in designing complex signal systems, which requires high level of field review and coordination with proposed civil improvements. These types of projects include street lighting and signing/stripping improvements. He is also experienced in traffic signal interconnect plans for various municipalities.

Tony will provide traffic control design, traffic signal maintenance per California MUTCD guidelines. He experience includes, but not limited to signing and striping, intersection control (signal, all-way, and one way stop control), traffic signal and flashing beacon preparation, sight distance review, timing programming, foundation design, and ad-hoc engineering work.

Tony holds a Masters in Science degree in Transportation Engineering and a Bachelor in Science degree in Civil Engineering from San Jose State University. He is a registered professional engineer in California.

Nick Ullman, Senior Associate

Nick Ullman is a senior associate who will be responsible for network review and design on an as-needed basis. He has 23 years of industry experience, which includes traffic signal system software integration, software development, digital video system replacement, project compliance, cutover plan conversion, system integration, and technical support.

B. Shopping and Storage Facilities

Our local area office for the City is located in our San Jose office. This facility also houses the Aegis warehouse, laboratory and testing facility as well as construction and heavy equipment. All technicians assigned to the City contract, as well as our main point-of-contact, are based out of this facility and have access to all required tools, equipment, facilities, services, and materials to perform the required traffic signal systems preventative maintenance and repairs.

Aegis currently has three facilities located in the state of California:

Anaheim

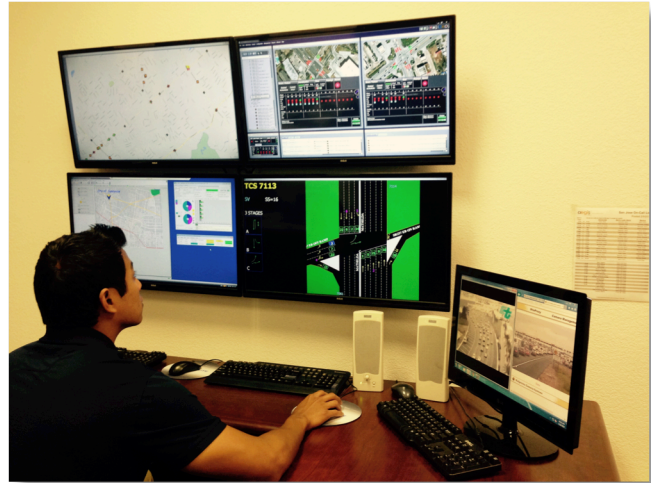
3360 East La Palma Avenue
Anaheim, CA 92782
(714) 360-3700

San Jose

1810 Oakland Rd Suite E
San Jose, CA 95131
(408) 577-1802

Fremont

43221 Osgood Road
Fremont, CA 94539
(408) 577-1802



Video Wall

Aegis operates one of the best in-house and fully functional testing and repair labs in the State of California. From printed circuit boards to full cabinets, Aegis is prepared for whatever test and repair situation that may arise. Our laboratory testing facility follows the State of California Department of Transportation (Caltrans) current specifications for NEMA/33X controllers and cabinets when applicable.

Lab Facilities

Our facilities are able to repair all types of traffic control equipment from a variety of manufacturers. We have two environmental chambers available to test the repaired equipment of requested by the City. In the unlikely event that Aegis staff are not able to make repairs in a timely manner, equipment will be sent to the original manufacturer for repairs.

C. Communication Equipment to be Used

Communications between the City and our technical support and administration staff is imperative to the success of our partnership. Aegis employs all necessary equipment to support modern communications to be readily available when needed.

Computerized Maintenance Management System

At the heart of Aegis communications with the City is through our computerized maintenance management system, *teamEpro*. *teamEpro* is constantly monitored throughout daily operations of our field technicians in real-time. In addition, field assets are tracked and reports are generated daily.

Please see **Section H – Traffic Signal Maintenance and Inventory Management System for the City** for more details.

Smartphones

Utilizing the latest technology, Aegis dispatches to our service vehicles via smart phone/ and/or cellular phones. This allows us to use text messaging, e-mail and traditional voice calls. Each technician has a smartphone, which is used to communicate work that has been accomplished at each location they visit. The technician's phone number and e-mail address is available to the City staff directly. Although we encourage all calls for service to go through our dispatch center for logging purposes, we encourage our customers to talk directly with their technicians as well.

Telephone Dispatch Service

As mentioned in **Section D Attachment A**, Aegis provides a 24 hours, 7 days a week dispatch service to record and dispatch all incoming calls. The Dispatch Console is integrated into *teamEpro*, our computerized traffic signal maintenance service. Using the Dispatch Console, TEAM Econolite receives all calls for the City of Sunnyvale, logs the calls, and dispatches the appropriate on-call technician.

D. Inventory of Equipment

Aegis staff has access to traffic signal control equipment, which enables us to meet the possible need for spare equipment. Additionally, our San Jose warehouse is stocked with everything from anchor bolts to z-crates, in an ongoing effort to meet the City's needs. In the event that we do not stock a specific item, we will contact one of our vendors and typically will-call most items the same day.

Provided below is a partial listing of our inventory equipment for emergencies:

- Fiber optic fan out kits
- Fiber connectors (ST, SC, LC)
- Splicing Tray/cartridges
- Single Mode Fiber Optics
- Polara Navigators and CCU's
- Type 1B Standards with self-supporting bases
- Vehicle and pedestrian signals
- LED lenses
- Appropriate frame work
- PPB frame works, button, with signs
- Type P cabinets
- 332 cabinets
- Type 170 controllers
- NEMA controllers
- Type II Service cabinets
- Type III Service cabinets
- Conflict monitors
- Load switches
- Flashers
- Detector amplifiers with LCD displays
- Fans
- Cabinet lamps
- Filters
- Pull boxes
- Pull box lids
- All phases of signal wires, streetlight and service wire
- Loop splicing material
- Conduit and fittings
- Extra batteries and availability of UPS system

In addition to the above, the following materials listed below will be stored at the same address for new or knockdown installations:

- Type 1B, & 1D Standards with anchor bolts, flanges, extension nuts, all thread, ground clamps and ground wire
- Type 17-2 with temporary base plate and weights
- Vehicle signals with Dialite ITE LED lenses, back plates and full circle visors
- Pedestrian signals with Dialite ITE LED lenses
- All vehicle and pedestrian frame works
- All pedestrian push button assemblies, signs and Bulldog/ADA buttons and tamper proof screws
- Assorted available back plates and full circle visors
- Astro brackets for SMA heads
- Photocells and assorted lamps for streetlight and ISNS repairs
- Sizes 1" thru 3" conduit and fittings
- All phases of vehicle and pedestrian signal wire
- Streetlight and service wire
- Number 3 1/2, 5 and 6 pull boxes with lids and hold down bolts

E. List of Special Equipment

Technical Support Equipment

Our proposed organizational staff has available for use some of the best troubleshooting and repair tools in the industry. Due to our technicians' expertise in specialty areas, such as Fiber optics, video detection, Intelligent Transportation Systems, and maintenance etc., Aegis staff uses specialized technical support equipment as listed below:

- OTDR
- Fusion Splicer
- Fiber Cleve
- Power Meter Light Source
- Tone Generator
- Multimeters
- Amp Probes
- TDRs
- Loop Finders
- Diagnostic Chips with Loop Back Cables (Tuning Modems)
- Meggers
- Oscilloscopes
- Clamp on Ground Resistance meter
- Opticom Emitter Tester
- Metrotech Facility Locator
- PCMT-2600 conflict monitor tester
- Battery Tester for 12VDC and 24VDC
- SIC Cable Field Tester
- LED Degradation tester
- Laptops for Signal System programming



Utilization of Specialized Equipment



Splicing Fiber

F. List of Repair, Utility, and Maintenance Vehicles

Aegis has the necessary vehicles for the successful completion of this contract. Equipment rotates in between locations when necessary. Below is a comprehensive list of Aegis vehicles for use with the City of Sunnyvale traffic signal maintenance and repair services.

Aegis Equipment				
Veh No.	Year	Description	Location	Condition
E-159	2015	Ford F550 4X2 Utility	San Jose	New
E-151	2014	Ford Transit Connect - Van	San Jose	New
E-152	2014	Ford Transit Connect - Van	San Jose	New
E-153	2014	Ford Transit Connect - Van	San Jose	New
E-154	2014	Ford Transit Connect - Van	San Jose	New
E-155	2013	Ford Transit Connect - Van	Anaheim	New
E-156	2014	Ford F-350 42' Bucket	San Jose	New
E-158	2014	Ford Escape SUV	San Jose	New
E-148	2013	Nissan NV Fiber Splicing Van	Anaheim	Excellent
E-149	2013	Ford F-450 Utility	San Jose	Excellent
E-150	2013	Ford F-350 XL Utility	Anaheim	Excellent
E-144	2012	Ford F-150 Pickup	San Jose	Good
E-145	2012	Ford F-450 Utility	Anaheim	Good
E-146	2012	Ford F-550 - 42' Bucket	San Jose	Good
E-147	2012	Ford F-550 - 42' Bucket	Anaheim	Good
E-157	2012	Ford F-550 - 42' Bucket	San Jose	Excellent
E-138	2011	Dodge 5500 - 42' Bucket	San Jose	Good
E-139	2011	Dodge 5500 - 42' Bucket	San Jose	Good
E-140	2011	Dodge 5500 - 42' Bucket	Anaheim	Good
E-141	2011	Dodge 5500 - 42' Bucket	Anaheim	Good
E-142	2011	Dodge 5500 - 42' Bucket	San Jose	Good
E-143	2011	Dodge 5500 - 42' Bucket	Anaheim	Good
E-133	2006	Ford F-450 4X2 Utility	Anaheim	Good
E-118	2005	Chevrolet Astro Van	Anaheim	Good
E-126	2005	Ford F-150 4x2 Pickup	Anaheim	Good
E-134	2005	International Crane	Anaheim	Good
E-108	2003	Chevrolet Astro Van	Anaheim	Fair
E-104	2002	Ford F-350 Pickup	Anaheim	Good
E-106	2001	Ford F-450 AT235 Bucket	San Jose	Good
E-110	2001	GMC C6500 50' Bucket	Anaheim	Good
E-124	2001	Ford F-450- Telsa 38' Bucket	Camarillo	Good
E-102	2000	Ford F-450 AT200 Bucket	Anaheim	Good
E-103	2000	Ford F-450 AT235 Bucket	Anaheim	Good
E-116	2000	Ford E-350 Van / Bucket	Anaheim	Good
E-119	2000	Ford F-450 AT235 Bucket	San Jose	Good
E-122	2000	Ford F-450 AT200 Bucket	Anaheim	Good
CP200		Compressor	Anaheim	Good
SV300		Arrowboard	Anaheim	Good
SV301		Arrowboard	San Jose	Good
CS001		Concrete Saw	Anaheim	Good
VC001		Ditch Witch Vacuum/HP Sprayer	San Jose	New
CS002		CC1800XL Concrete Saw	San Jose	New

G. Safety Programs and Training

Aegis has extensive experience and an excellent track record ensuring our employees are well trained in adopting and adhering to safety practices and standards that ensure our work environments are safe for our employees, subcontractors, and the public. Aegis maintains safety policies and procedures and conducts regular training and refresher courses. In fact, all of our field employees must attend weekly safety meetings, more than double the OSHA requirement of twice monthly.

Standard documentation includes:

- IIPP (Illness Injury Prevention Plan)
- Job Hazards Analysis
- Tailgate Safety Meeting
- Safety Manual Consent
- Code of Safe Work Practice
- Safety Statement

In addition to the above documentation, Aegis also ensures the following minimum requirements are met in our field work force:

- Employees are Work Zone Safety Certified
- Employees must obtain a minimum of ten hours per year of additional training
- Employees are required to achieve and maintain IMSA Certification
- Employees operating aerial equipment go through annual aerial training
- Crane operators are certified by the National Commission for the Certification of Crane Operators (NCCCO)

Employees are our most important assets; their safety is our greatest responsibility. It is the policy of Aegis ITS to make every effort to provide a safe working environment, to eliminate safety hazards, and to provide adequate Personal Protective Equipment (PPE) for all employees. Further, it is our goal to create safety awareness among our employees and subcontractors so that each individual understands that they have the ultimate responsibility to work safely. It is also our intention to eliminate both unsafe working conditions and unsafe work practices. It is the policy of our company to:

1. Comply with all federal, state, and local regulations and client rules governing safety at the job site.
2. Take expedient action to correct unsafe conditions or work practices.
3. Promote safety awareness.
4. Hold each employee accountable for his or her individual responsibility for safety.
5. Encourage our employees to inform their supervisor immediately when unsafe conditions are present without fear or reprisal.
6. Provide our employees with the training to support the accident reducing techniques necessary in implementing this policy.

Aegis' IIPP establishes the minimum safety standards for managers, supervisory personnel, and employees. It assigns responsibilities; establishes standard procedures for hazard evaluation, employee and supervisor training, program enforcement, and lists the minimum accident prevention requirements for typical operations.

In addition, we have a mentoring program, which allows a senior technician to mentor a traffic signal worker and provide hands-on training with a variety of controllers and cabinets. These mentoring sessions take place in the lab and out in the field. Aegis senior technical staff is responsible for training the Traffic Signal Maintenance workers. Training includes hands-on maintenance and repair of all ITS field components, equipment, and tools. This training is on a day-to-day basis and weekly technical topics are

also discussed.

Aegis also encourages and supports the active pursuit of International Municipal Signal Association (IMSA) Work Zone Safety certification, which many of our staff currently holds.

H. Traffic Signal Maintenance and Inventory Management System for the City

Records

Aegis utilizes the Asset Management Module in *teamEpro* to track and keep records of assets. Utilizing a real time inventory system increases accuracy and makes accessing the information quick and easy.

Additionally, the electronic system reduces the amount of paper used in the field, which is another step towards becoming a better partner with the environment.

Preventative Maintenance Checklist Form

Utilizing the electronic Preventative Maintenance (PM) checklist designed for the City, each site listed in the RFP will be visited. All items listed will be completed and checked following the procedural requirements of the City. At this time, if any safety issues are found, immediate action will be taken to correct the situation, and the City's representative will be notified. Aegis will maintain all maintenance records in each controller cabinet showing the date and time checked.

Utilizing our web-based system, *teamEpro*, all maintenance services from the field will be displayed as it occurs electronically. *teamEpro* is customizable to the items the City has designated in the RFP, allowing the information to be available as it happens rather than the printed PM checklist that is submitted following each inspection. The City's representative has the

PM Checklist	
A. Cabinets:	
<input type="checkbox"/> Vacuum Cabinets	<input checked="" type="checkbox"/> N/A
<input checked="" type="checkbox"/> Door Fit, Gasket	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Lock Operation	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Fan Operation	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Cabinet Light	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Air Filter	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Terminal Blocks	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Documents Present	<input type="checkbox"/> N/A
Remarks:	
B. Signal Controllers:	
<input checked="" type="checkbox"/> Controller LED's	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Controller Display	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Timing	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Phases on recall	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Detectors and Loops	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Isolators and Preempt	<input type="checkbox"/> N/A
Remarks:	
C. Signal Heads:	
<input checked="" type="checkbox"/> Lens Condition	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Lamps and LED's	<input type="checkbox"/> N/A
<input type="checkbox"/> 3M Heads	<input checked="" type="checkbox"/> N/A
<input checked="" type="checkbox"/> Signal Heads	<input type="checkbox"/> N/A
<input type="checkbox"/> Remarks	<input type="checkbox"/> N/A
D. Pedestrian Heads:	
<input checked="" type="checkbox"/> Aimed Correctly	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Lens Condition	<input type="checkbox"/> N/A
Remarks:	
E. PPB:	
<input checked="" type="checkbox"/> Placing Calls	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Cover Plates	<input type="checkbox"/> N/A
Remarks:	
F. Misc:	
<input checked="" type="checkbox"/> Pull Box	<input type="checkbox"/> N/A
<input checked="" type="checkbox"/> Mast Arm	<input type="checkbox"/> N/A
UPS System:	
Event Counter:	348
Hours of Operation:	NA

PM Checklist

convenience of accessing the permanent documents at any time of the day.

Aegis will also provide the digital versions of the maintenance checklists monthly to the City along with the payment invoices.

Request for Proposal #F15-83

Traffic Signal Preventative Maintenance and Repair Services

City of Sunnyvale, California

Different Tabs for teamEpro Computer Interface

Location Details

302 - Sunnyvale, City of
007-115 - Reed Ave @ Timberpine Ave

LOC	007-001	@ Remington Dr
302	007-008	Sunnyvale Saratoga @ Remington
302	007-009	Bernardo Ave @ Heatherstone
302	007-010	Fair Oaks @ Old San Francisco
302	007-011	Fair Oaks Ave @ Evelyn Ave
302	007-012	Fair Oaks Ave @ Kifer Rd
302	007-013	Fair Oaks Ave @ Arques Ave

1 2 3 4 5 6 7 8 9 10 11

☒ Auto Refresh 300 secs. Refresh

Call Status ▼

View

007-115 - Reed Ave @ Timberpine Ave

Location Detail | Call Tickets | Inventory | Activity at Location | Preventative Maintenance

302 - Sunnyvale, City of
007-115 - Reed Ave @ Timberpine Ave

Location Details

Region/Area No.	302
Name	Sunnyvale, City of
Location Code	007-115
Description	Reed Ave @ Timberpine Ave
Interconnect	False
Remarks	ALL PB ARE TYPE "B" W/BUBBLE BEE AT 36" EB MA POLE R73-3 ALL PED ARE NEW LED TYPE SE CORNER MA POLE R-81 SE CORNER TREE IS BLOCKING 8" SIGNAL HEAD/INDICATOR FOR SB THRU TRAFFIC - WILL WRITE W/O TO TREES AND LANDSCAPING
Other Equipment	TESCO UPS 6-BATTERIES ----- Type: N/A New Cabinet Installed On: 03/24/2004 Actuation: FULLY ACTUATED Program Module: 412C Program: 233Rv2-2.9 IISNS Legend: IISNS6 "TIMPERPINE" EB Remarks: ALL PB ARE TYPE "B" W/BUBBLE BEE AT 36" EB MA POLE R73-3 SE CORNER MA POLE R-81 2 SVIT, 4 MAS, 2 twit, 2 sv2t Other Equipment: TESCO UPS 6-BATTERIES ASO248131674 -----

Attachments

[7115-1.pdf](#)
[7115.pdf](#)
[007-115.JPG](#)
[007-115 t.jpg](#)

007-001 - Homestead @ Hollenbeck

Location Detail | Call Tickets | Inventory | Activity at Location | Preventative Maintenance

302 - Sunnyvale, City of
007-001 - Homestead @ Hollenbeck

Location Details

Region/Area No.	302
Name	Sunnyvale, City of
Location Code	007-001
Description	Homestead @ Hollenbeck
Interconnect	False
Remarks	4 NO U TURN SIGNS INDICATORS ARE "COUNT DOWN" TYPE N/E CORNER IS NOT COUNT DOWN TYPE ----- Type: N/A New Cabinet Installed On: 10/21/1999 Actuation: FULLY ACTUATED Program Module: 412C Program: 233 Rv2-2.9 IISNS Legend: NONE Remarks: 4 NO U TURN SIGNS 4 242 ISOLATOR CARDS 2SV3T, 2SVIT, 2TV2T, 8MAS, 2SPST, 4SPIT Other Equipment: GDI MODEM VC006228 -----
Other Equipment	

Attachments

[Z001-1.pdf](#)
[Z001.pdf](#)
[Z001](#)
[Homestead@Hollenbeck.JPG](#)

Request for Proposal #F15-83

Traffic Signal Preventative Maintenance and Repair Services

City of Sunnyvale, California

007-001 - Homestead @ Hollenbeck

Location Detail Call Tickets Inventory Activity at Location Preventative Maintenance											
	No.	Call Date Time	Person Calling	Call Back Number	Corner	Direction	Dispatch Date Time	ETA	Response Time	Call Status	Employee
Select	70856	3/12/2015 2:43:00 PM	JOEL @ CITY SUNNYVALE	408-464-4075	n/a	n/a	3/12/2015 2:44:00 PM		19 m	Completed	Robert Martinez
Select	70856	3/12/2015 2:43:00 PM	JOEL @ CITY SUNNYVALE	408-464-4075	n/a	n/a	3/12/2015 2:44:00 PM		22 m	Completed	Robert Martinez
Select	70856	3/12/2015 2:43:00 PM	JOEL @ CITY SUNNYVALE	408-464-4075	n/a	n/a	3/12/2015 2:44:00 PM		60 m	Completed	Robert Martinez
Select	66668	10/10/2014 5:06:00 PM	Joel	408 464 4075	n/a	n/a	10/10/2014 5:06:00 PM		54 m	Completed	Brian Davis
Select	62739	5/8/2014 8:39:00 AM	Carmen Talavera	408-730-7522	n/a	n/a	5/8/2014 8:40:00 AM			Completed	Robert Martinez
Select	55878	7/30/2013 3:14:00 PM	Joel	408-730-7522	n/a	n/a	7/30/2013 3:14:00 PM		40 m	Completed	Brian Davis
Select	51312	1/20/2013 10:01:00 AM	CARMEN TALAVERA	408 859 8963	n/a	n/a	1/20/2013 10:00:00 AM		39 m	Completed	Kevin Werre
Select	41407	10/28/2011 2:18:00 PM	Carmen Talavera	408-730-7522	n/a	n/a	10/28/2011 2:19:00 PM		15 m	Completed	Robert Martinez
Select	38096	6/6/2011 11:15:00 AM	Joel	408-730-7522	n/a	n/a	6/6/2011 11:16:00 AM	30 min	24 m	Completed	Robert Martinez
Select	29184	1/29/2010 5:46:00 PM	CARMEN	408 730 7522	n/a	n/a	1/29/2010 5:55:00 PM		40 m	Completed	Fernando M Martinez

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007-001 - Homestead @ Hollenbeck

Location Detail Call Tickets Inventory Activity at Location Preventative Maintenance									
Region/Area Name	Item No.	Item Description	Mfg	Serial No.	Model No.	Barcode	Quantity	Type	
Sunnyvale, City of	P700888	26-3-70				P700888	1	Inventory	
Sunnyvale, City of	P700889	PED POLE				P700889	1	Inventory	
Sunnyvale, City of	P700890	26-3-70				P700890	1	Inventory	
Sunnyvale, City of	P700891	26-3-70				P700891	1	Inventory	
Sunnyvale, City of	P700892	1B				P700892	1	Inventory	
Sunnyvale, City of	P700893	PED POLE				P700893	1	Inventory	
Sunnyvale, City of	P700894	1B				P700894	1	Inventory	
Sunnyvale, City of	P700895	26-3-70				P700895	1	Inventory	
Sunnyvale, City of	007-001	Reno detector	z Reno A&E	N/A	Model C	N/A	1	Inventory	
Sunnyvale, City of	CM700001	980507167 210P CMU	0	980507167	210P	CM700001	1	Asset	
Sunnyvale, City of	CT700001	170E McCain 5757 170 Controllers	McCain	5757	170E	CT700001	1	Asset	
Sunnyvale, City of	220-06	Pull Box Lid - #6 Bolt Down					1	Inventory	
Sunnyvale, City of	220-36	N16 Pull Box w/bolt down lid					1	Inventory	
Sunnyvale, City of	501-15	4" Box Fan					1	Inventory	
Sunnyvale, City of	12InGLED	12" Green LED					4	Inventory	
Sunnyvale, City of	12InGLEDArrow	12" Green Arrow LED					8	Inventory	
Sunnyvale, City of	12InRLED	12" Red LED					4	Inventory	
Sunnyvale, City of	12InRLEDArrow	12" Red Arrow LED					8	Inventory	
Sunnyvale, City of	12InYLED	12" Yellow LED					4	Inventory	
Sunnyvale, City of	12InYLEDArrow	12" Yellow Arrow LED					8	Inventory	

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007-001 - Homestead @ Hollenbeck

Location Detail Call Tickets Inventory Activity at Location Preventative Maintenance										
	Project No	Project Type	Project Description	PM Schedule	Employee Name	Damage Report No	Date Time Started	Date Time Arrived	Date Time Completed	Reason
Select	RR0072015	RR	Rolling Report 2015		Robert Martinez	113009	4/14/2015 8:55:37 AM	4/14/2015 8:55:37 AM	4/14/2015 6:26:40 PM	PCR
Select	RR0072015	RR	Rolling Report 2015		Robert Martinez	111888	3/12/2015 3:44:02 PM	3/12/2015 3:44:02 PM	3/12/2015 3:44:31 PM	Call
Select	RR0072015	RR	Rolling Report 2015		Robert Martinez	111885	3/12/2015 3:06:06 PM	3/12/2015 3:06:06 PM		Call
Select	RR0072015	RR	Rolling Report 2015		Shannon S Stokes	111884	3/12/2015 3:03:16 PM	3/12/2015 3:03:22 PM	3/12/2015 5:12:42 PM	Call
Select	MO007	RR	Mark Outs		Robert Martinez	111541	3/4/2015 12:32:37 PM	3/4/2015 12:48:58 PM	3/4/2015 1:48:11 PM	Mark-out
Select	RR0072015	RR	Rolling Report 2015		Shannon S Stokes	109257	1/9/2015 11:34:21 AM	1/9/2015 11:34:21 AM	1/9/2015 12:02:05 PM	Found
Select	PM0072015	PM	Preventative Maintenance 2015	Monthly PM 01/01	Shannon S Stokes	N/A		1/9/2015 7:42:06 AM	1/9/2015 11:33:21 AM	N/A

Diagram below is a sample managed by *teamEpro*.



At the same time as the submission of monthly invoices, Aegis will submit to the City a computerized activities report to the City of Sunnyvale for the previous month worked. The report will be available in real time from the *teamEpro* customer interface and can be downloaded in multiple file types, including Excel, PDF, TIFF, CSV, and XML:

- Time the service calls were received, time arrived at the intersection, the response time, the number of hours spent for each repair, and a specific listing of intersections with three calls in one month.
- A complete record of all work that was performed on the City traffic signal equipment during the time period covered on the report including the make, model, and serial number of any major components, or other equipment that was newly installed at each intersection.
- Time and date the PM work was performed.

- Employee
- Location

- Date
- Work Plan

Meetings

Loc. Code	Location Name	Project No	Project Description	Employee	DR No	Started
007-053	Mathilda Ave @ Olive Ave	PM0070108	Preventative	Robert Martinez	N/A	1/11/2008 12:00:00

Meetings will be arranged and established on a mutually agreed upon time and day when necessary. We anticipate at a minimum the project manager and the primary signal technician to attend the meetings. Aegis will discuss previous month's repairs, the anticipated workload, status of spare parts and inventory, and other outstanding issues during these meetings. Notes taken during the meetings will be distributed to the attendees. Aegis's maintenance supervisor will also be available to meet the City's representative on a quarterly

Multiple File Types

basis.

Aegis's computerized traffic signal maintenance and inventory management system *teamEpro* is incorporated and implemented throughout our methodology and approach to the following activities and services.

Ongoing Maintenance and Support

Routine Maintenance

Aegis will continue to provide the City of Sunnyvale with quarterly and annual preventative maintenance services on signalized intersections, In-Roadway Warning Lights (IRWL), and flashing beacon systems as listed in the RFP. We will maintain one copy of the completed form for each intersection and for each inspection in our local business throughout the term of this contract.

Traffic Signal Control Equipment

If awarded, we will continue to repair, replace, or otherwise render in good working order any and all defective parts of the traffic signal control equipment with like make and model parts. No permanent change of control mechanisms will be done without prior approval. Any equipment removed from the controller cabinet will be notified within 24 working hours.

Networking and Communication Abilities

Aegis ITS provides services beyond the construction sector. We are highly proficient in designing, programming, and implementing ITS communications. We have experience in Layer 3 and Layer 2 Networking, serial, digital and wireless communications, and Pan Tilt Zoom Closed Circuit Television Cameras. Two of our most recent projects detail the scope of work we can provide.

Emergency Services



Emergency Response

Aegis will respond within one (1) hour after the City's notification of the following events:

- Any signal controller malfunction
- Burned out red or green ball or arrow display
- Signal equipment knockdowns
- Traffic signal device malfunction
- Failure, loss of indication
- Accident damage
- Construction damage
- Any traffic signal service call
- Other situations that is potentially hazardous to public safety

Our shop and storage facilities are established within 10 miles travel distance to the intersection of Mathilda

Avenue and Olive Avenue. Aegis facilities houses all the necessary staff, equipment, and materials to perform the required temporary and permanent repair of accident damage to traffic signal equipment and/or devices.

Aegis will provide a 24/7 dispatch service to record and dispatch all calls. The Dispatch Console is integrated into *teamEpro*, our Field Data Collection service. Using the Dispatch Console, Aegis can receive all calls for the City of Sunnyvale, log the calls, and dispatch the appropriate on-call technician. This service is a 24-hour, 7-day-a-week existing operation that utilizes a toll-free number for all incoming calls. The calls are dispatched to whoever is on call for the City and all information is logged into the database to tie in with the field data.

This allows for accurate reporting. Our technicians carry enough temporary or replacement equipment to assure that the location is in safe operation and we have available temporary base plates and poles up to a Type-17.

In the event that additional help is needed, Aegis always has additional employees on call as well as a utility crew who can bring out a crane, spare base plate, and pole, or heavy equipment if the need arises.

Monitoring Emergency Calls

Aegis will only run calls, called in by the City's designated representatives. We will verify calls with the listed locations before running the call, but please note that our toll free number should only be given to those authorized to call in problem reports. The number is not public and should not be published as such.

Additionally TEAM Econolite will comply with the post call notification. This information will also be available on the City Graphical User Interface accessible via the Internet.

Signal Upgrade, Modifications, and Installations

If requested, Aegis will install, modify, and/or upgrade traffic signals and all associated hardware or traffic safety devices. All such work will be considered extra work and all additional work will be performed to the satisfaction of the City.

Safety Lights and Internally Illuminated Street Name Signs Maintenance and Repairs

Maintenance will be provided for all safety lights and Internally Illuminated Street Name Signs (IISNS). No work will commence without the approval from the City.

Underground Service Alert (USA) Mark-Out and Location Services

Aegis will locate and mark traffic signal facilities within 24 hours of notification by the City of underground work. USA mark-out locating services will be billed as separate item as extra work.

Extra Work

Aegis will seek the approval from the City first of any extra work needed not stated in the RFP. Compensation for extra work and repairs will be in accordance on an agreed upon labor rates, material markups, equipment rates, and miscellaneous costs between both parties.

Exhibit B

"REVISED PROPOSAL FORM"

Request for Proposals #F15-83

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SECTION VI. PROPOSAL FORM REVISED PROPOSAL FORM FOR TRAFFIC SIGNAL PREVENTIVE MAINTENANCE AND REPAIR

Honorable City Council
City of Sunnyvale
Sunnyvale, California

The undersigned proposer hereby offers to perform the required services for the following price(s) in strict compliance with the specifications, terms and conditions set forth in this Request for Proposals.

A. Preventive Maintenance Rates*

1. Quarterly Scheduled Maintenance	\$83.79	Per Intersection
2. Annual Scheduled Maintenance	\$532.86	Per Intersection
3. Quarterly And Annual Scheduled Maintenance	\$42.38	Per Lighted Crosswalk

*Includes emergency calls

B. Labor Rates for Extra Work, As Required (use extra sheets if necessary)

Labor Category	Straight Time (\$ per hour)	Overtime (\$ per hour)	Doubletime (\$ per hour)
Light Fixture Maintenance	\$74.37	\$106.12	\$137.86
Construction Specialist	\$88.66	\$123.36	\$158.08
Communication Systems Technician	\$103.68	\$146.96	\$190.25
Inside Wireman	\$139.76	\$193.45	\$247.14
Traffic Signal Analyst	\$125.00	\$125.00	\$125.00

C. Equipment Rates for Extra Work, as Required (use extra sheets if necessary)

Equipment Category	\$ Per Hour	\$ Per Job
Bucket Truck	\$25	\$130
Utility Truck	\$21	\$110
Crane Truck	\$75	\$450

"REVISED PROPOSAL FORM"

Request for Proposals #F15-83
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D. Miscellaneous Services, As Required

1. 21 Day Controller Cabinet Test Operation and Certification Including Controller and All Equipment (per Caltrans and City Specs.) \$997.00 Each Cabinet
2. 21 Day Traffic Signal Controller Test Operation and Certification (per Caltrans and City Specs.) \$347.00 Each Controller
3. Installation of Inductive Loops:
 - a) 6'x6' Type A, B, D, E, and Q
 - 1) Quantity 1 to 4 \$598.00 Each Loop
 - 2) Quantity 5 to 8 \$548.00 Each Loop
 - 3) Quantity 9 or more \$527.00 Each Loop
 - b) 6'x15' Type C
 - 1) Quantity 1 to 4 \$598.00 Each Loop
 - 2) Quantity 5 to 8 \$548.00 Each Loop
 - 3) Quantity 9 or more \$527.00 Each Loop
 - c) 2'x6' Type C Bicycle Loop
Quantity 1 to 4 \$527.00 Each Loop
4. Installation of Video Detection/FLIR System
 - a) Full eight (8) vehicle phase 4-legged signalized intersection – four (4) camera system \$4,380.00 Each System
 - b) Two (2) vehicle phase one approach – one camera system \$2,190.00 Each System

E. Materials, As Required

1. Actual Cost plus 10 Percent (%) Markup
2. Permanent Traffic Signal Pole Knockdown Replacement With New Equipment (Per Current City Spec)
 - a) 36" high pedestrian pushbutton pole with necessary equipment (reuse existing foundation) (One PPB Assembly) \$591.00 Per Pole
 - b) 36" high pedestrian pushbutton pole with necessary equipment (provide new foundation) (One PPB Assembly) \$1,556.00 Per Pole
 - c) 1B pole with necessary LED indications and equipment (reuse existing foundation) (TV-1-T, SP-1-T, and one PPB Assembly) \$2,318.00 Per Pole
 - d) 1B pole with necessary LED indications and equipment (provide new foundation) TV-1-T, SP-1-T, and one PPB Assembly \$3,964.00 Per Pole

"REVISED PROPOSAL FORM"

Request for Proposals #F15-83

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F. Provide And Implement Computerized Traffic Signal Maintenance And Inventory Management System

Lump Sum Total: \$ 0.00

G. Proposed Annual Cost Increases:

* Whichever is less

2 nd year	% Increase <u>2% or CPI Bay Area *</u>
3 rd year	% Increase <u>2% or CPI Bay Area *</u>
4 th year	% Increase <u>2% or CPI Bay Area *</u>
5 th year	% Increase <u>2% or CPI Bay Area *</u>

ADDITIONAL INFORMATION

1. Company Name Aegis ITS, Inc.

2. Address from which service will be provided: _____
1810 Oakland Road, Suite E., San Jose, CA 95131

3. Location of Shop and Storage Facility (must be within ten miles of the intersection of Mathilda and Olive Avenues, Sunnyvale):
1810 Oakland Road, Suite E., San Jose, CA 95131
43221 Osgood Road, Fremont, CA 94539

4. Number of Years Providing the Specified Service *13 years

5. Business Organization (Check One):

- ☐ Individual Proprietorship
☐ Partnership
☒ Corporation
☐ Other _____

If incorporated, provide the following information:

Date of incorporation *2002 State of incorporation California

Names and Titles of All Officers and Directors Michael C. Doyle, Chairman of Board and Directors,
Douglas Terry, P.E., Chief Operating Officer, Rodney Mathis, Executive Vice President, John W. Tracey,
Chief Financial Officer, Raquel Leano, Secretary, David St. Amant, Director
If an individual or partnership, provide the following information:

Formation date of Company Not Applicable

Name and address of all partners, indicating whether they are general or limited partners:

Not Applicable

Not Applicable

* Originally operated as Econolite Traffic Engineering and Maintenance was incorporated in 2002.

"REVISED PROPOSAL FORM"

Request for Proposals #F15-83

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6. Indicate whether proposer has ever failed to complete any contract awarded to it. If so, note when, where and why. Attach additional sheets, if necessary.

Aegis ITS, Inc. has never failed to complete any contracts awarded to us.

7. Indicate whether proposer has been or is the subject of a bankruptcy or insolvency proceeding or subject to assignment for the benefit of creditors.

Aegis ITS, Inc. is not the subject of a bankruptcy or insolvency proceeding or subject to assignment for the benefit of creditors.

8. List subcontractors, if any, who will perform work under this contract. Attach additional sheets, if necessary.

- A. Company Colebank Contruction

Location 1585 Welburn Avenue, Gilroy, CA 95020

Describe work to be subcontracted Directional Boring and Foundation Drilling

License No. 675095, (408) 640-4482

- B. Company Loop Installation and Repair

Location 6830 Country Court, Granite Bay, CA 95746

Describe work to be subcontracted Inductive Loops

(916) 791-4020

- C. Company _____

Location _____

Describe work to be subcontracted _____

9. List three organizations for whom proposer performed similar services of a similar scope in the last three years.

- A. Organization City of Sunnyvale, California

Location 45 W. Olive Ave., Sunnyvale, CA 94086

Contact Person Carmen Talavera, Sr. Transportation Engineer Telephone Number (408) 730-7522

Describe work performed by bidder Traffic Signal Maintenance Services; Scope of work includes full monthly and annual intersection maintenance and 24 hour emergency response for 129 intersections.

"REVISED PROPOSAL FORM"

Request for Proposals #F15-83
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Date work was performed Ongoing

B. Organization City of San Ramon, California

Location 5000 Crow Canyon Road, San Ramon, CA 94582

Contact Person Jose Gonzalez, Maintenance Supervisor Telephone Number (925) 973-2835

Describe work performed by bidder Streetlight Maintenance On-Call Traffic Signal; Scope of Work

includes preventative streetlight maintenance for 5,000 streetlights, and 24 hour on-call services for the City's 73 intersections.

C. Organization City of Pleasanton, California

Location 200 Old Bernal, Pleasanton, CA 94566

Contact Person Eric Kurz, Engineering Technician Telephone Number (925) 931-5668

Describe work performed by bidder Traffic Signal Maintenance; Scope of work includes preventative maintenance,

24 hour emergency response for the City's 101 intersections and safety streetlights.

10. Attach to this Proposal Form narratives in the following format which provide the following information. (Use additional pages if necessary)

A. A list of names, titles, and qualifications of key personnel, including at least one Traffic Signal Technician and one Traffic Signal Analyst, who will perform work under this contract as well as their roles in relation to the contract. Include their certification, experience and training.

SEE SECTION QUALIFICATIONS OF KEY PERSONNEL

B. A description of proposer's shop and storage facilities, including whether such facilities currently exist or will be established within ninety days of contract award, facility size, a list of activities that will take place at the facilities, etc.

SEE SECTION SHOP ANDDD STORAGE FACILITIES

C. A list of proposer's communications equipment that will be utilized under this contract, including telephone, radio, pager, cell phone, fax, email, etc.

SEE SECTION COMMUNICATION EQUIPMENT TO BE USED

D. An inventory of equipment (i.e. poles, signals, LEDs, traffic signal controllers, etc.) which will be stocked for emergencies and maintenance spares and the location where the equipment will be stored.

SEE SECTION INVENTORY OF EQUIPMENT

"REVISED PROPOSAL FORM"

Request for Proposals #F15-83

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- E. A list of special equipment, testing services, repair facilities or special services which will be available to the City.

SEE SECTION LIST OF SPECIAL EQUIPMENT

- F. A list of proposer's repair, utility and maintenance vehicles, including the number, type, age, location and condition. Include photos with the proposal.

SEE LIST OF REPAIR, UTILITY, AND MAINTENANCE VEHICLES

- G. A description of proposer's training and safety programs for its field employees.

SEE SECTION SAFETY PROGRAMS AND TRAINING

- H. A description of the computerized traffic signal maintenance and inventory management system which will be provided and implemented in Sunnyvale.

SEE SECTION TRAFFIC SIGNAL MAINTENANCE AND INVENTORY MANAGEMENT

SYSTEM FOR THE CITY

- I. List of relevant employees, with skill, experience, training, certifications, qualifications and office location.

SEE SECTION RELEVANT EMPLOYEES

"REVISED PROPOSAL FORM"

Request for Proposals #F15-83

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ADDENDA ACKNOWLEDGMENT

Bidder acknowledges receipt of the following Addenda:

Number 02 Date April 24, 2015

Number 01 Date April 21, 2015

Number _____ Date _____

SIGNATURE

Company Name

Aegis ITS, Inc.

Address

1810 Oakland Road, Suite E.,

San Jose, CA 95131

_____	Executive Vice President
Signature	Title

Rodney Mathis	April 29, 2015
Name (printed or typed)	Date

(714) 575-5704	(714) 630-1973
Telephone Number	Fax Number

27-0206675	063720
Tax ID Number	Sunnyvale Business License Number

C-10, Electrical, C-07, Low Voltage Systems	969067
Contractor License Classification	Contractor License #

Contractor and Subcontractor DIR Registration Number

1. 1000010720 (Aegis ITS, Inc.)
2. 1000009353 (Loop Installation and Repair)
3. _____

RMathis@aegisits.com

E-mail Address

Company's Business Organization (Check One):

- ☐ Individual Proprietorship
☐ Partnership
☒ Corporation
☐ Other _____

INSURANCE REQUIREMENTS FOR CONTRACTS

Contractor shall procure and maintain for the duration of the contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work by the Contractor, his agents, representatives, or employees.

Minimum Scope and Limits of Insurance Contractor shall maintain limits no less than:

1. **Commercial General Liability**: \$1,000,000 per occurrence and \$2,000,000 aggregate for bodily injury, personal injury and property damage. ISO Occurrence Form CG 0001 or equivalent is required.
2. **Automobile Liability**: \$1,000,000 per accident for bodily injury and property damage. ISO Form CA 0001 or equivalent is required.
3. **Workers' Compensation** Statutory Limits and **Employer's Liability**: \$1,000,000 per accident for bodily injury or disease.

Deductibles and Self-Insured Retentions

Any deductibles or self-insured retentions must be declared and approved by the City of Sunnyvale. The contractor shall guarantee payment of any losses and related investigations, claim administration and defense expenses within the deductible or self-insured retention.

Other Insurance Provisions

The **general liability** policy shall contain, or be endorsed to contain, the following provisions:

1. The City of Sunnyvale, its officials, employees, agents and volunteers are to be covered as additional insureds with respects to liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor; premises owned, occupied or used by the Contractor; or automobiles owned, leased, hired or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the City of Sunnyvale, its officers, employees, agents or volunteers.
2. For any claims related to this project, the Contractor's insurance shall be primary. Any insurance or self-insurance maintained by the City of Sunnyvale, its officers, officials, employees, agents and volunteers shall be excess of the Contractor's insurance and shall not contribute with it.
3. Any failure to comply with reporting or other provisions of the policies including breaches of warranties shall not affect coverage provided to the City of Sunnyvale, its officers, officials, employees, agents or volunteers.
4. The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.
5. Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, cancelled by either party, reduced in coverage or in limits except after thirty (30) days' prior written notice by certified mail, return receipt requested, has been given to the City of Sunnyvale.

Acceptability of Insurers

Insurance is to be placed with insurers with a current A.M. Best's rating of not less than A:VII, unless otherwise acceptable to the City of Sunnyvale.

Verification of Coverage

Contractor shall furnish the City of Sunnyvale with original a Certificate of Insurance effecting the coverage required. The certificates are to be signed by a person authorized by that insurer to bind coverage on its behalf. All certificates are to be received and approved by the City of Sunnyvale prior to commencement of work.